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A PLAYER GRAND

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Frontispiece

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THE
"PLAYER-PIANO"

ITS CONSTRUCTION

HOW TO PLAY—WHAT TO PLAY
AND
HOW TO PRESERVE IT AND MAKE
ADJUSTMENTS WHEN NECESSARY

BY

D. MILLER WILSON, F.R.G.S.

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PREFACE

THIS instruction book is intended to be an elementary guide to the possessors of piano-players and player-pianos, and as the reader will be presumed to have no previous knowledge, technical or otherwise, of these instruments, the subject matter will be presented in the simplest manner possible, the use of technical terms being, where possible, omitted. Should the author succeed in imparting some clear and intelligent ideas as to the construction and care of the player-piano, as well as how and what to play, together with how to remedy minor troubles that may arise and thus make the instrument a pleasure and joy, not only to the owner, but to others in the family circle, the *raison d'être* of this book will have been achieved.

The writer feels convinced that at no distant time, and when the true artistic value of the player-piano as an educational factor is thoroughly appreciated, one will be able to study this wonderful instrument in a musicianly and artistic manner under the tuition of masters of the art of playing the player-piano in modernly equipped schools of music.

The technical difficulties, mostly mechanical, of modern pianoforte music, have become so great that only genius and years of hard work can fit one to overcome these. In the player piano we have an instrument to which the most difficult and complex pieces are as a simple tune to a master of technique. The player-piano has no limit to its technical capabilities, and like a great steam or electrical hammer which can crack a walnut or strike with tons of force, it has every gradation of touch from the softest pianissimo to the loudest fortissimo.

The educational department of the London County Council realizing that few children have the gift to become executants has instituted lectures on "the appreciation of music" in their curriculum, and both the Council and the professional musicians who deliver the lectures have realized the fact that the instrument best suited for practical demonstrations is undoubtedly the "player-piano."

Sir Henry J. Wood says: "I myself have some occasion to realize the value and benefit of the pianola to the London musical public, for a good many of the individuals composing our audiences at Queen's Hall are acquiring by its means a closer acquaintance with the great orchestral masterpieces. By degrees the already considerable numbers of amateurs who have taken up the instrument will, as it were, leaven the whole body of concert goers, so that we may reasonably hope for the time when the majority of our audiences will go to a concert prepared to listen to the programme in a spirit of intelligent appreciation, bred of a close intimacy with works they are about to hear.

"What we must do with music nowadays is to separate the appreciative from the creative or executive faculties, just as we have long since agreed to do in the case of the other arts. Only in this way can the composer and the interpretative artist hope to flourish in the future; for at present the supply of professional musicians seems inclined to exceed the demand, and, unless we can greatly increase the number of their appreciators, the outlook for our rising artists is not a rosy one.

"It is a foolish and short-sighted policy to despise any means by which we may add to the sum total of musical appreciation in this country."

Edwin Evans, the well-known musical critic, writes : " The player-piano relieves the musician of the technical difficulties of the keyboard. It emancipates him from the physiological tyranny of ten obstinate fingers which require years of persuasion to do their work. It does not relieve him from the duty of thinking musically ; on the contrary, taking these difficulties out of his way, makes it a point of honour with him to give correspondingly fuller employment to his brain and sensibilities. Try and imagine what would happen if an intellect like that of Busoni, who can work such miracles beyond surmounting the keyboard difficulties of modern music, were set free from all those difficulties and concentrated entirely upon the true essence of music, which is a thing independent of keyboards, hammers and levers. In the process of converting musical thoughts into musical sound there cannot be too much simplification. Modern music is becoming more and more complex ; a friend of mine who read at sight the score of Strauss's " Heldenleben " when that work was new, confided to me recently that he had been confronted with a score he could not make head or tail of, and if it could happen to him it could happen to anybody. Without going to such lengths there are dozens of scores nowadays which it is an impossibility to read at the piano and very trying to read on paper. There the player-piano is a boon and a blessing, for it unravels every mystery and solves every problem."

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CONTENTS

CHAP. PAGE

PREFACE v

I. SKETCH OF THE ORIGIN OF THE "PIANO-PLAYER" AND THE "PLAYER-PIANO" . 1

II. EXPLANATION OF THE TERMS "PIANO-PLAYER" AND "PLAYER-PIANO" . . 5

III. THE CONSTRUCTION OF THE PNEUMATIC "PLAYER-PIANO" 13

IV. CONSTRUCTION (*contd.*) 23

V. PEDALS, EXHAUSTER UNITS, AND EQUALIZER MECHANISM 33

VI. SOME TROUBLES THAT ARISE AND HOW TO REMEDY THEM 35

VII. MAXIMS FOR PLAYER-PIANO OWNERS . . 45

VIII. THE MUSIC ROLL 47

IX. INSTRUCTIONS FOR USING THE TEMPO AND NOTE TESTER ROLL 51

X. THE PLAYER-PIANO IN ITS CAPACITY OF MUSIC MASTER 54

XI. HOW TO PLAY 58

XII. WHAT TO PLAY 61

XIII. HOW TO APPRECIATE MUSIC . . . 65

XIV. MEANING OF VARIOUS EXPRESSION MARKS AND SYMBOLS 70

XV. LIST OF DIFFERENT MAKERS OF PLAYER-PIANOS 78

GLOSSARY OF TERMS 100

INDEX 103

ILLUSTRATIONS

FIG. PAGE

A PLAYER GRAND . . . *Frontispiece*

1. PNEUMATIC ACTION 9

2. THE PNEUMATIC MOTOR . . . *facing* 16

3. AN UPRIGHT PIANOFORTE ACTION . . . 49

4. AN UPRIGHT PLAYER-PIANO 79

5. SECTIONAL VIEW OF ANGELUS ACTION . . 81

6. THE AUTOTONE 83

7. THE CAROLA PLAYER 86

8. THE CAROLA PLAYER 87

9. INTERIOR OF PISTONOLA 93

10. 11. 12. 13. MOTORS AND VALVES OF THE PISTONOLA. . 95

14. A STEINWAY UPRIGHT 97

15. A STEINWAY-WELTE UPRIGHT 98

THE
"PLAYER-PIANO"

CHAPTER I

BRIEF HISTORICAL SKETCH OF THE ORIGIN OF THE "PIANO-PLAYER" AND THE "PLAYER-PIANO"

THE history of the player-piano as we understand it now dates back many years ; as to its origin it would indeed be difficult to trace it to any one man. Numerous inventors have, within the last century, evolved many clever ideas from which, doubtless, some suggestion was conveyed to the minds of other workers in the field of mechanical devices for operating the notes of the piano, and thus by the process of accretion the present day instrument was brought into being with all its alluring usefulness and perfection.

Mechanical means of producing music can be traced back centuries, and, in order to appreciate the tremendous difficulties which had to be overcome, one has only to read the life of one of the greatest workers in the field of pneumatics, Mr. John McTammany. He says: "There was hardly a hardship that can be conceived, not a trial or tribulation that can be imagined, incident to the life of an inventor, that I did not experience during the years I was engaged in the development of the player-piano, and there is scarcely a trial or misfortune that a litigant before the bar could be subjected to that I did not endure during the next twenty years that I was battling in the courts or defending the player through the press."

It has been said that necessity is the mother of invention; but, while such is not necessarily the case, yet it may be said with truth that necessity was the mother of the player mechanism. The term player mechanism is employed as it is broad enough to include reed and pipe instruments as well as the piano or string devices, the mechanism being applicable to all of them. Owing to the fact that Mr. McTammany was a soldier, and received injuries in the line of duty during the progress of the war which unfitted him for his regular occupation, he was compelled to choose some less strenuous employment to earn a livelihood, which ultimately led up to the discovery of the player principles and to its final development. He further says: " Nor should we forget that the music trades, in common with other industries, were considerably in evidence during the civil strife between the States; that upon the bloody battlefields of the South the music dealer of Dixie, the piano manufacturer of the North, faced each other and fought and fell in defence of what they believed to be the right, and to-day their bodies lie side by side among the unidentified dead in the neglected and forgotten trenches of the South, the dust of the blue and grey mingling together beneath the swaying cedars and sighing pines of the Southland, and in those trenches, had fate so decreed, might also be sleeping, to-day, the sires and ancestors of some who are prominent in the music trade to-day, a Mehlin, a Werlein, a Hutchins or a Crew and many others I could name."

The fact, therefore, that the player came into existence in and through the war and the additional fact that it is bound, to a certain extent, to supersede the conventional piano, makes the origin and history of the player a matter of supreme interest to the musical industries, and the millions who have the love of music at heart but are unable to play the conventional piano. Of all the inventions that have been conceived by mortal man the player-piano is the one that is nearest and dearest to the hearts and homes of the inhabitants of the world.

The principle of pneumatics has for many years been used successfully in the construction of tubular pneumatic actions for organs.

In the year 1863 Fourneaux, a Frenchman, devised an apparatus which had for its principle a pneumatic device for actuating the keys of the piano ; this, undoubtedly, formed a very powerful incentive to others ; hence followed in rapid succession piano-players of various names by different makers, some good, some otherwise.

The most active period was, undoubtedly, from 1896 to 1906, since when thousands of instruments have been put on the market by leading manufacturers which are to all intents and purposes as near perfection as could be hoped for.

The precursor of the player-piano was doubtless the " Organette " which still does duty and is the means by which many a roadside musician gains a livelihood.

The enormous impetus which has been given to the trade in player-pianos within the last twenty years is undoubtedly due to the artistic and educational value of these instruments. They have brought to the millions the means whereby they are enabled to become masters of the world's music and to enjoy the privilege of not only *hearing* but *actually producing* the sublime creations of the great masters, old and new.

How seldom now one hears even mediocre pianoforte playing in the home or at a musical party ! The day of mediocrity in music is past ; the evolution and revolution in things musical is such, that, in order to become a great artist, and to be able to play difficult modern compositions, one must really be nothing less than a genius and be prepared to devote hours daily for several years in order to acquire technique or finger dexterity. All this is a sheer waste of valuable time in the case of those who have no real executive ability, besides being extremely irksome, but, whereas one may not have executive ability, one may have an innate love of music, and the fact that so many try to learn to play the piano proves that there is an inborn desire to satisfy a craving for music in almost every soul, and so, the player-piano comes as a boon and a blessing to everyone and fills an aching void. To the person who is fond of music but cannot play, the player-piano is indeed a divine gift.

CHAPTER II

EXPLANATION OF THE TERMS "PIANO-PLAYER" AND "PLAYER-PIANO"

WHAT is termed the "piano-player" is the cabinet form which is wheeled up to the piano. This was probably the first successful form used for playing the pianoforte other than by the fingers or manually. The fact of the "piano-player" having to be taken away from the piano when the piano is required for ordinary playing and the difficulty in putting it back in position without altering the regulation and relative position of the fingers of the player to that of the piano keys, not to mention the amount of space taken up by the piano-player, made it objectionable, therefore makers set to work and evolved the "player-piano," which is a pianoforte with the player mechanism placed inside the piano, thus economizing space which in these days of small flats is a great consideration. Different makers have different ways of fitting their actions inside the piano ; some have the striking or lifting pneumatics underneath the keyboard and others above the keys. So far, the writer's experience has been in favour of the striking pneumatics above the keys, firstly, because of the greater ease and accessibility when requiring to fine regulate the player mechanism; secondly, because of the proximity of the striking pneumatic to the pianoforte hammer and jack, which must necessarily give greater delicacy of adjustment and dynamic control, so necessary to secure power, resiliency, perfect repetition and a light sensitive movement when required.

Principles of Pneumatics. In order the better to understand the *modus operandi* of player-pianos of the pneumatic type it will be as well to give a simple explanation of air pressure. Normal air pressure at sea level is roughly 15 lbs. to the square inch, below sea level—in valleys, for instance, it is greater, and at a high altitude much less, but as we are treating with pneumatics we shall reckon, as the normal, 15 lbs. to the square inch. Air, although invisible, has both weight and density and is capable of expansion and compression like most gaseous bodies, being very elastic. Like water, air is always seeking a lower level. The following experiment will prove this. Suppose we get a glass chamber with a partition in the centre, the cubic space being the same on both sides of the partition, the partition having a port or opening covered by a valve and situated near the bottom of the partition. Now fill one chamber with water, leaving the other empty; suppose there is a tube with a water gauge fixed to the bottom of each chamber and we note the pressure indicated on the gauge fixed to the full chamber; then open the port in the partition and allow the water to enter the empty chamber, the water will find its level, the pressure indicated on the gauge that is connected with the chamber, that was full, will now register only half the pressure, and a similar pressure will be registered on both gauges. Instead of water, suppose both chambers to contain air at an atmospheric pressure of 15 lbs. to the square inch, close the port in the partition, making certain that the port is air tight, hermetically seal each chamber, now fix an air pressure gauge to each of the tubes leading from the bottom of each chamber and, by means of an exhauster, exhaust the air from one chamber, the gauge attached to the unexhausted chamber will show a pressure of 15 lbs. to the inch, whereas the gauge attached to the exhausted chamber will stand at zero. Now open the port in the partition and see what happens. The pressure indicated on the first gauge, which was 15 lbs. to the square inch, will now show 7½ lbs. and the gauge which was at zero will also register 7½ lbs., and, if the port between the two chambers were closed, one chamber left hermetically sealed and the other opened to admit external air, the gauge on the open chamber would again register 15 lbs. to the square inch while the other would still only register 7½ lbs. Water being a fluid of certain density and weight retains its bulk, so that, when communication was established between the two chambers, each compartment was half filled, whereas, in the case of air, which is an exceedingly elastic gaseous body, the air expanded and filled both chambers, the pressure being reduced in proportion to the expansion, or, in other words, the greater the expansion the lower the pressure. Now the principle enunciated here is the same as in the operation of pneumatic player-pianos; therefore, if the foregoing is clearly understood, and constantly kept in mind, there should be little difficulty in acquiring a fair and useful knowledge of pneumatics as applied to player-pianos. Always bear in mind that there is no such thing as a vacuum chamber in a player-piano, the so-called vacuum chamber being simply an equalizer for reducing air pressure from a higher to a lower power or *vice versa* as the case may be.

The two large bellows operated by the pedals are exhausters, their function being to exhaust the air from the inside of the player after it has done its work. The exhausters are formed of a movable and an immovable wall, the walls being made of quartered hard wood, usually three-ply and cross-banded, which gives great strength and helps to prevent warping. The movable wall is hinged to the immovable wall and connected all round by rubber impregnated cloth, a given distance being allowed at the end farthest from the hinged end, for expansion of the exhauster. In the walls of the exhausters port holes are cut to allow air to pass in and out (Fig. 1, P*a*) of the main air way. (Fig. 1, A). These port holes are covered by leather valves or flaps. (Fig. 1, F and F*a*). The exhausters are kept closed by V shaped springs (Fig. 1, S), one prong of the spring being fixed in the movable wall of the exhauster, the other in the upright bracing or other part of the piano proper. The moment we start pedalling, we open the exhausters and increase the cubic space therein, as a result of which the air contained in the player rushes in and fills the extra space, provided one end of the air chamber is sealed, and no external air is admitted. The air which was in the player, prior to opening the exhausters by pedalling, and which had a pressure of 15 lbs. is, because of the expansion, reduced to 14 lbs. Now when we stop pedalling, the exhausters begin to close by compression of the spring (Fig. 1, S), and, as the cubic space in the exhausters becomes less on closing, the air pressure becomes greater and impinges on the valve (Fig. 1, F*a*), thus closing the port holes (Fig. 1, P*a*), and preventing the passage of the higher air pressure into the main air chamber (Fig. 1, A), which is of a lower pressure, but, as the air in the exhausters is of a higher pressure than the external air, the valves (Fig. 1, F) are forced open, and the exhausters emptied, thus justifying the name, exhausters. When we pedal we depress each pedal alternately, thus forming a compensatory action, with the object of trying to secure a continuous movement of the air, but this is not possible, as there is an appreciable static condition, or period of rest, between the depressing of the one pedal and of

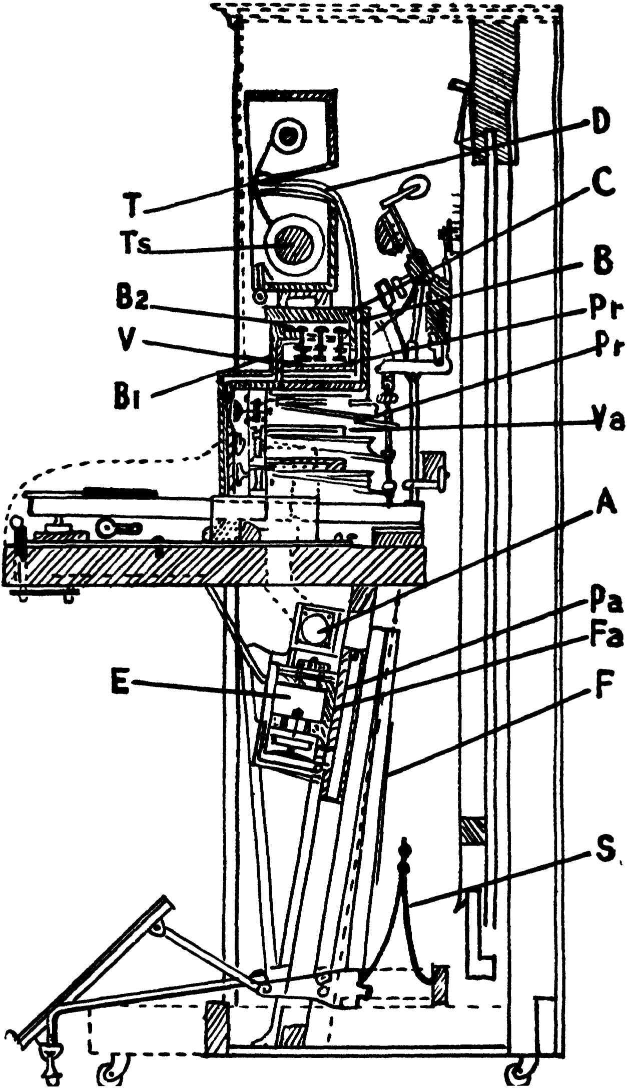


Fig. 1

the other, therefore it becomes necessary to call into being an extra equalizer, to take up this period of rest; this equalizer (Fig. 1, E) is, in construction, similar to the exhausters, but usually not so large. In the double valve system, to be explained later, there are usually two equalizers and in the single valve system one. The equalizer is always open, in its inert state; it is kept open by a V shaped spring (Fig. 1, S); the inside wall has port holes communicating with the main air chamber. When the exhausters are at work and have reduced the air pressure in the main air chamber, the external air pressure being greater forces the equalizer to close or collapse, and, as the air pressure in the air chamber is momentarily increased during the period of rest spoken of, the equalizer, with the aid of the spring, begins to open and act the part of an auxiliary exhauster, thus bridging over the period of rest and securing continuous air movement. Having got thus far we shall now consider the top action in its relation to the exhausters and equalizers. First of all, we shall consider the single valve action as being the more readily understood.

Fig. 1, T, shows the tracker bar, duct leading from tracker bar to primary pouch, reduced air pressure chamber, button just above primary pouch, attached to valves by stem, vent or bleed hole channel communicating with exhausters and large striking pneumatic. First, let us suppose that there is a music roll put in, covering the holes in the tracker bar, now let us start pedalling. The moment we pedal, the exhausters get to work and reduce the air-pressure in the main air chamber (Fig. 1, A) in the reduced pressure chamber just above primary pouch (Fig. 1, B), and in the duct leading from the tracker bar to the chamber just under the primary pouch (Fig. 1, V), *through the* vent or bleed hole, all other parts at this moment are under natural air pressure, i.e. 15 lbs. to the square inch. It might be useful to remark here that the reduction in pressure in the duct leading from the tracker bar to the chamber under the primary pouch, is not so much as elsewhere because of the smallness of the vent or bleed hole ($\frac{1}{64}$ in. diameter). Now suppose the roll travels on and comes to a hole which is exactly opposite a hole in the tracker bar, what happens ? The pressure being reduced in the duct, the external air of higher pressure rushes in through the duct, pushes the pouch up, because the air pressure above the pouch is reduced, and cannot resist the higher pressure below the pouch ; as the pouch rises, it presses on the button (Fig. 1, B_2) in the reduced air pressure chamber, and raises the lower valve off its seat, thus making a connection with the reduced air pressure chamber, and, through this, with the exhausters. It will be seen that there are two valves on the stem, so that when the pouch pushes up the button it opens the passage from the reduced air pressure chamber to the power pneumatic and, as the upper valve (Fig. 1, B_2) rises, it closes the opening through which external air of normal pressure is admitted, and, consequently, the air way connection from the power pneumatic (Fig. 1, Pr) to the exhausters being uninterrupted, the air pressure in the power pneumatic is reduced, and, the external air pressure being greater, the power pneumatic collapses. The power pneumatic is placed usually just under the whippen of the piano, so that, when it collapses, it lifts the whippen, thus bringing the piano hammer in contact with the string.

We shall now consider the double valve type of action, and, provided the foregoing has been clearly understood there should be not the slightest difficulty in understanding the working of the double valve system. In the double valve system a secondary pouch and valves are placed between the primary pouch and valves and the power pneumatic. When the tracker bar is covered completely by a music roll and we begin to pedal, the air pressure in the duct leading from the tracker bar to the underside of the primary pouch chamber (Fig. 1, P) is reduced through the vent or bleed hole (Fig. 1, V), then we play through the music roll until we come to a hole in the roll which is registering with a hole in the tracker bar, the external air, of normal pressure, rushes down the duct, forces up the primary pouch, which in turn forces up the primary valve and the top disc on the same stem, thus admitting external air to the channel leading to the secondary pouch, which inflates and pushes up the button in the secondary reduced air pressure chamber, which in turn forces the lower valve on the stem from its seat and causes the upper disc to close the port to the atmospheric air. The channel leading to the power pneumatic being now in communication with the secondary reduced air pressure chamber, the power pneumatic collapses, and being under the whippen causes the piano hammer to strike the string (Fig. 3):

CHAPTER III

THE CONSTRUCTION OF THE PNEUMATIC "PLAYER-PIANO"

In order the better to understand the capabilities of the pneumatic player-piano we shall here describe, in its simplest form, the mechanism, and with the aid of the accompanying diagrams explain the functions of the various parts.

We have taken the player-piano, because, for reasons stated, it is destined to take the place of the cabinet form; in fact, it has now almost superseded the piano-player in England and absolutely in America. In any case, what applies to the one equally applies to the other in so far as the principle of construction is concerned, the difference being mostly in the disposition of the parts.

To most people outside the music trade, and a good many in it, what happens when the air enters the hole in the tracker bar is a profound mystery; this we shall endeavour to explain as simply as possible.

Now, supposing we put a roll in, attach it to the take up spool (Fig. 1, Ts), wind it through until all the holes in the tracker bar (Fig. 1, T) are completely covered, now set the tempo lever (Fig. 2, T) at stop, i.e. at the extreme left, at the same time making certain that the re-wind lever (Fig. 2, R) is at "play" not "re-wind," otherwise the moment we began to pedal, the paper would wind back on to the feeder spool which is the roll itself. Now pedal a few times. What happens is this: we exhaust all, or rather nearly all, the air out of the instrument and if the valves shown at (Fig. 1, Va) are carefully regulated and bed well the air reduction should be very considerable. If we now move the tempo lever a little to the right, we allow the music roll to travel slowly forward until the holes in the paper come into view and pass over the tracker bar, exposing the holes in the tracker bar, and allowing air to enter, which it readily does with more or less force according to the amount of pedalling and consequent reduced air pressure. The air now having entered the hole in the tracker bar, what happens ?

In (Fig. 1, D) there is a duct or tube leading to a primary diaphragm (Fig. 1, P). When the air enters the aperture in the tracker bar, it rushes along this duct or channel and expands the pouch or diaphragm. Now just here—and in order to clear away a difficulty which the writer has found to exist in the mind of nearly everyone who has approached this subject for the first time—it is absolutely necessary to make the following perfectly clear. Looking at the section showing the aperture in the tracker bar and the duct leading down to the diaphragm, one is apt to wonder how a vacuum can be obtained, inasmuch as, when the roll is entirely occluding or closing the hole in the tracker bar, there appears to be no connection with the reduced air chambers beyond the diaphragm. This difficulty is swept away at once when one realizes that there is a small hole called the vent or bleed hole (Fig. 1, V), which is in communication with the main exhaust, thus creating a partial vacuum in the chamber between the aperture in the tracker bar and the diaphragm. The primary diaphragm, being inflated by the air entering the hole in the tracker bar, pushes up the valve which is connected by a stem to the valve (Fig. 1, B_1). The operation of the diaphragm pushing up the valve, thus closing all behind it, is to open the valve and destroy the partial vacuum by admitting external air into the chamber (Fig. 1, C). The air thus admitted rushes along a channel and pushes forward a secondary diaphragm which in turn pushes forward the valve (Fig. 1, B_2), which, like the previous valves mentioned, is connected by a stem to the valve (Fig. 1, B_1), which, when pushed forward, excludes the open air from the large striking pneumatic (Fig. 1, Pr) and allows it to be deflated by the tension in the exhaust or reduced air chamber, thus causing the note in the piano to be played.

It should be thoroughly understood that the bleed hole is a most important factor in the operation of the pneumatic; should the bleed hole be partially closed by fluff from the roll, or by dust sucked in through the tracker bar, the note will act sluggishly and repetition be interfered with. On the other hand, if, when clearing the dust out of the bleed hole, should it be necessary, the needle used is of too great a calibre, the hole will be too large, which would also interfere with repetition.

If the reader has carefully followed the foregoing, and grasped the idea, he will have a pretty fair and useful idea of pneumatics, the principle of which is always the same, no matter what form the construction may take.

A recent type of valve is termed the *unit system*; each part of the player mechanism is a *unit*, having one function and instantly accessible, being easily removed from the other parts of the player. The valve is of the inverted type operated by gravity and therefore more sensitive, with the result that the minimum of air tension is required to operate it. One great advantage is the ease with which the valve can be removed for cleaning; all that is necessary is to take off the face board of the valve chamber, usually situated just under the spool box, undo a nut in front of a powerful steel spring, thus releasing the unit valve, and after clearing the bleed the valve is replaced. Another advantage is, that, should by any chance a valve fail to act satisfactorily, a new valve can be substituted instantly and easily. The valves are all regulated at the factory of the manufacturer, therefore, rarely require adjusting. It will be seen that the unit system offers many advantages. Care must always be taken not to screw the nut too far when replacing the unit, two turns being about enough.

The Pneumatic Motor. The pneumatic motor is operated by a series of pneumatics not unlike the power pneumatic in construction. Some motors have three, four, five and six points or pneumatics, according to whose make of player-piano is used. The fixed walls of the pneumatics are placed side by side on the trunk board (Fig. 2, M). In the upper part of the trunk-board is a channel (Fig. 2, C), which forms an exhaust chamber and is connected, by means of a rubber tube, to the main exhaust. On the opposite side of the trunk-board to that on which the pneumatics are fixed, slide valves are placed, exactly opposite each pneumatic, there being one for every pneumatic; under the valves there are two port holes (Fig. 2, Mv), one in an exact line above the other. The upper port leads into the exhaust chamber in the trunk board, the lower port opens into the pneumatic to admit atmospheric air. The pneumatics and the slide valves are connected with the crankshaft by means of a rod or arm. The crankshaft is cranked at equal distances in order to make a complete circle. *The slide valves are hollow,* thus allowing the air in the pneumatic to be exhausted through the upper port hole when the slide valve is covering both ports. When the valve uncovers the lower port hole the connection with the exhaust chamber is destroyed and the pneumatic opens or expands, or, as already stated, if both port holes are covered by the valve, the air in the pneumatic is exhausted and the pneumatic collapses or closes, and, as each pneumatic opens and closes alternately, because of the formation of the crankshaft, a complete revolution of the crankshaft is obtained and driving power transmitted to the transmission gear (Fig, 2, G). Now, as the air in the main exhaust is constantly changing from a high to low pressure, or the reverse, we can easily imagine that this change of air pressure would be constantly altering the pace of the motor, and we should have to be constantly moving the time lever, to increase or retard the speed of the motor, in order to secure a steady tempo. To obviate this undesirable condition of things, an auxiliary equalizer is fixed somewhere between the motor and the main exhaust. This equalizer is frequently spoken of as a Governor, because its function is to govern this fluctuation of air pressure which we are considering. The auxiliary equalizer is in form very much like a large power pneumatic, one wall is fixed, the other movable. It is kept expanded by means of a tension spring. Inside the equalizer are two ports, one leading from the motor, the other to the gate box, in which are placed the valves which regulate the general speed of the motor and also the rewind. The port leading from the motor is covered by a hinged valve, this valve has a spring on top of it tending always to close it, which it would do, but for a stop-block fixed to the inside of the moving wall of the auxiliary equalizer. As the auxiliary equalizer is in direct connection with the main exhaust, the harder we pedal the greater the exhaust and consequent collapse of the auxiliary equalizer. *As the moving wall of the equalizer collapses,* it allows the hinged valve to drop nearer the port hole, thus restricting the flow of air from the motor to the main exhaust, and equalizing the tension, which secures an even tempo. The next thing to consider is the *motor gate box, which contains the tempo slide valve* and the re-wind valve. The gate box is usually placed on the top right hand side of the main exhaust chamber under the keyboard of the piano, and connected with the motor auxiliary equalizer above, which governs the air pressure from the motor itself. The tempo valve in the gate box is of a peculiar shape, something like a bell with a long narrow stem, opening into the main exhaust trunk and covered by a slide valve held in position by a spring. This slide valve is connected by a wire to the tempo lever in the key slip. The re-wind valve opens also into the main exhaust trunk and has a valve cover connected with the re-roll lever in the key slip. The port hole for the re-wind valve is different in shape to the tempo port, as the object of the re-wind valve is to get the maximum reduction of air pressure at once, whereas, with the tempo valve, the reduced air pressure must be gradual.

We shall now consider the cut-off box because of its connection with the re-roll lever. There is, in most pneumatic actions, an auxiliary equalizer placed on the top left-hand side of the main exhaust trunk, under the keyboard. Its function is to govern the tension in the top or valve action in the same way as the motor auxiliary equalizer governs the tension in the motor. The ports and valves being similar in both, now, the cut-off box is placed in close proximity to, and in fact is almost part of, the equalizer, inasmuch as, when the re-wind lever is at re-roll the valve, which is a slide valve, slides over the port, and destroys the connection between the top action and the main exhaust chamber, through the auxiliary equalizer. As the re-roll lever, in its triune capacity, reverses the gear action, opens the re-wind port in the motor gate box, and closes the valve in the cut-off box, we are able to re-wind the music roll back on to the *take-up-spool without the music playing backwards* should the player action be one in which the top, or valve, action is exhausted direct from the main exhaust trunk, without the intermediary of an auxiliary equalizer, or expression governor, the variation of the striking force would have to be obtained by the pedalling, in this case the compression and expansion springs of the exhausters and equalizer respectively would be of lower tension, and the bellows units smaller, in order to get prompt and sensitive action. The cut-off box in this case would be directly interposed between the top action and the main exhaust trunk. In some makers' pneumatic actions there is a cut-out stop, so that if the player desires to cut-out, or skip, any part of a roll this can be done without the movement of the roll being interfered with. This is done by an extra valve in the cut-off box operated from the key slip by depressing a button. This extra valve may be controlled by a direct lever or by a pneumatic, in which case there would be a duct leading to a pouch and valve which would open or close the passage between the valve action and exhausters. Before leaving the subject of the motor governor, it might be well to explain a method of tempo control adopted by a well-known firm of player manufacturers, it is this: a tilting tablet is placed on the key slip, this is connected with the motor governor, by depressing the tablet to the left the governor is forcibly collapsed, and the motor slows down, according to the distance the tablet is depressed, if the tablet is pushed right down the motor stops. If the tablet is pushed down to the right the governor expands and the speed of the motor is increased. Every gradation of tempo can be got instantly; therefore, it is a most valuable adjunct for phrasing purposes. The moment the fingers are taken away from the tilting tablet, the motor resumes the normal pace set by the tempo lever. There are many forms of the pneumatic motor, some with three, four, five, six, and even ten points, others have double pneumatics, i.e. one superimposed on the other, end to end as it were. In this type of motor there are two atmospheric ports to the pneumatics but only one to the exhaust chamber in the motor trunk board, the one slide valve controlling the two pneumatics. In this case it must be a four or six point motor. This is a good example of reciprocating action. The slide valves may be made of wood or metal with metallic seats and bearings.

One well-known firm uses a clock-work spring motor, which is wound up by pedalling. There is a friction clutch which slips to prevent over-winding. There is a centrifugal ball governor to steady it and it is controlled by a brake. The advantages claimed for this motor are: (1) It relieves the exhausters of having to exhaust for the motor. (2) It re-winds automatically, thus saving the work of pedalling back the roll. (3) It does away with the necessity of a gate box and an auxiliary equalizer. Still, notwithstanding, the pneumatic motor holds the field probably for reasons of synchronization. Yet another maker has metal cylinders and pistons instead of pneumatics. This motor is more complex but extremely clever and most satisfactory from a mechanical point of view. In the motor of another well-known American firm, the transmission gear is an interchangeable unit; as the gears are never out of mesh they cannot be stripped, the gears being in mesh whether playing forward or re-winding. By an ingenious use of clutches on the shaft carrying the large sprocket and small cog the change from play to re-roll is effected. The governor has an automatic spring tensioning device, the tension of the spring being fixed by the degree of force used in pedalling.

In the old days there used to be frequent trouble by the motor stopping dead when pumping a bit hard to get a crash on a chord when nearing the end of a long roll. This was caused by the extreme tension on the motor and increased reduction of air pressure in the tracker duct causing the roll to cling to, or hug unduly, the tracker bar. This rarely happens nowadays because of more expert craftsmanship and more scientific construction.

Never Oil the Motor Slide Valves or any woodwork. Use powdered graphite or black lead instead.

To determine if the motor is "tight," disconnect the exhaust tube from the nozzle on the motor trunk board, also the sprocket chain, place a piece of blotting paper over the nozzle (a piece of soft leather will do as well), rotate the motor, crankshaft in the *opposite* direction to that which it turns when playing forward. If the motor will not revolve, then it is tight. If it revolves there is a leak. In that case examine the gussets of the pneumatics; if they leak patch with sheepskin or an old glove. Should the slide valves be made of wood, they may be warped and not bedding properly on their seat; in that event the movement of the motor will be of a jerky character. In this case, take the slide valve off, and grind it dead flat on a piece of *fine* glass paper laid on a perfectly flat surface. A smoothing iron will suit the purpose. Should the motor race, the probability is that the tension or expansion spring which keeps the motor governor, or auxiliary equalizer, expanded is too strong, therefore weaken it by taking some of the bend out of the prongs if it is a V shaped spring, or, if it is a spiral spring, by lengthening the spring. Most up-to-date motor governors have an adjusting arrangement. Should the motor slow up on pumping a bit hard, then the governor spring requires strengthening. If it is a V shaped spring, bend the prongs outwards more and as near the joint of the two arms as possible in order to gain strength. If a spiral spring, shorten it. One must always make certain that the slide valve in the motor gate box is completely uncovering the port when the tempo lever is at the extreme right and that the valve is completely covering the port when the tempo lever is at the extreme left. Dust particles on the valve seat will prevent the motor stopping, or warping of the valve in the gate box would do the same thing. There are fibre buttons for regulating the throw of the valves in the motor gate box.

CHAPTER IV

THE CONSTRUCTION OF THE PNEUMATIC "PLAYER-PIANO" (*continued*)

Control Mechanism. Although we have considered various controls in other parts of the book it will do good to review them again in a separate chapter. First, we shall consider the control of expression, which means governing the force of the blow of the piano hammer. In cases where the top action containing the valves is in direct connection with the exhauster bellows, much of the expression is obtained by the degree of force used in pedalling, but other devices are brought into action to supplement the pedals, as, for instance, when the celeste rail in the piano is operated by a pneumatic at either end of the piano action, and controlled from two buttons on the key slip which open valves immediately underneath the key slip: the opening of these valves admits atmospheric air to a duct which leads to the pneumatics, the pneumatics are connected to the exhaust chamber and so the buttons really perform the same function as the music roll when it exposes a hole in the tracker bar. The celeste rail is usually divided in the centre, so that the bass or treble section can be lowered in front of the piano hammers at will, the piano hammers striking the string through the interposed celeste felt produces a very soft tone. Then again, in some cases, the rail on which the hammers rest, is divided into two sections, both operated by pneumatics in a similar way to the celeste rail. This is known as the half-blow system, for by shortening the blow of the hammer a pianissimo is obtained.

The method of producing soft effects just described is usually met with in player actions of the single valve type, whereas, in the double valve system, soft effects are obtained by interposing an auxiliary equalizer between the valve box and the exhausters. In most double valve actions the valve box is divided exactly in the centre, making a treble and bass compartment, in this case two auxiliary equalizers are used, one for treble and one for the bass section. These expression boxes, as they are sometimes called, are capable of being elaborated to almost any extent. In the simplest form, when the valve inside the auxiliary equalizer is operated mechanically by a lever on the key slip, wonderful shades of expression can be got. The lever lowers the hinged valve and consequently reduces the quantity of air on its way to the exhausters from the valve chest; also, the harder one pumps the greater the collapse of the auxiliary equalizer, thus permitting the hinged valve inside, which is always being forced down near the port by a spring, to get nearer the port. It will be remembered that there is a stop block inside the auxiliary equalizer which prevents the hinged valve from closing altogether. The same result can be got by using pneumatics to operate the auxiliary equalizers. In this case the pneumatics are either controlled by buttons, on the key slip, which open vent holes immediately under the keyboard and allow atmospheric air to pass along a rubber tube to the pneumatic or by a hole in the tracker bar opening into a duct which leads to the pneumatic. In this case the music roll would have an extra perforation to coincide with the vent hole in the tracker bar. This brings us to the melody cut rolls. When these are used the valve chest is on low tension normally and whenever a note is to be accented a small perforation appears on one side or the other of the roll, air passes through the tracker duct and along to a pneumatic which opens the hinged valve inside the equalizer and allows the maximum of air reduction, which produces instantly a high tension, and the accent is obtained. The hole in the paper is made extremely small so that it quickly passes over the vent hole; the moment the hole is covered the pneumatic ceases to operate and the valve in the auxiliary equalizer drops nearer the exhaust port and the tension is instantly lowered. There is the Solo Apollo of Melville Clark, which has two distinct sets of pneumatics. The one set operates for the accompaniment on low tension and the other for the solo part on high tension; this is an ideal arrangement; but, of course, it makes the instrument more complex. In this type of player-piano it is not necessary to cut the accented note in front of the accompaniment, and this is a great advantage; still, if the ordinary accenting device is used, the melody note is cut so slightly in advance that it is hardly perceptible. Next we come to the device which actuates the sustaining or loud pedal of the piano, this may be either mechanically or pneumatically controlled. If mechanically controlled it is done from a lever on the key slip which is in direct contact with the rod which lifts the dampers in the piano. For artistic effects the writer has found this the most effective and satisfying, but, where the person operating the player-piano has no idea as to when and where to bring on the sustaining pedal, it is undoubtedly better to have the sustaining pedal operated pneumatically. This is usually done by a large pneumatic operated by the usual primary and secondary valve. The primary valve may be controlled either from a button on the key slip or a special perforation in the music roll, the latter being best for the non-musical performer, inasmuch as the exact time that the pedal should be used is arranged by the musician who marks off the phrasing of the piece before the roll is cut. One thing against the pneumatically operated sustaining pedal is the power consumed; besides it is inclined to be noisy and slow of action.

The Re-wind Mechanism. When the re-wind lever is placed at re-wind, what happens is this: a small cog-wheel (Fig. 2, A) which is connected with the driving gear is disconnected from the large cog-wheel, usually fixed on the end of the take-up spool; the take-up spool now being freely movable in either direction, the driving is done from the mechanism on the right hand (usually) side of the feeder spool, and the music is wound back on to the feeder spool. To play forward the action is reversed, the small cog being brought into mesh with the large cog on the take-up spool, and, the feeder-spool being released, the roll winds on to the take-up spool. When re-winding, the paper is apt to roll up loosely; this is caused through the take-up spool being released and getting a greater momentum on than the feeder spool. To obviate this, there is usually an automatic friction brake, which retards the motion of the take-up spool. In re-winding, the exhaust from the valve action is cut off by means of a gate in the expression regulating mechanism, which is wired up to, and connected with, the re-wind lever; the object of this is to increase the speed when re-winding; a very desirable thing. Should the notes play when re-winding, it proves that the valve in the gate box is not closing, either through the wire being disconnected from the valve, the valve not bedding through warping, or, dust particles lodging on the seat of the valve.

There is also a pneumatic re-wind. It operates in the following manner—When the motor is in action and the roll going forward a pneumatic, at the side of the tracker box, is collapsed during the playing of the roll; attached to the pneumatic is the main driving shaft and gear wheel which meshes with the take-up spool. On moving over the re-wind lever, after having played through the roll, the pneumatic rises as it inflates, and puts the gear wheel out of mesh with the take-up spool, at the same time causing the fly-wheel on the driving shaft to press against the friction wheels attached to the music roll spool holder. The pneumatic operates through the re-wind lever by a sliding valve in the motor governor.

Expression Devices. In most instruments there are two buttons, one for softening the bass, the other for softening the treble. These are connected with two control bellows, the action of which is very similar to the motor governor, both bellows are placed between the exhaust trunk and the pneumatics. The bass pneumatics are separated from those of the treble, hence the necessity of two control bellows, or chokers as they are sometimes called, These bellows, like the motor governor, are kept expanded by a spring. Should the springs be too strong, there will be little difference when the buttons are depressed; if they are too weak, the controls, or chokers, will be too easily sucked in, and the power so reduced that there will be very little tone produced. Without touching these buttons, the harder one pedals, the greater the force with which the notes will be struck; but—and please note this most carefully—when either button is depressed, the harder one pedals *the softer will be the bass or treble,* according to which button is depressed. Supposing, for instance, we put down the bass button only and pedal hard, the result will be that the treble will be very loud and the bass very soft. If we now depress the right or treble button and leave the bass button up, the bass will be very loud and the treble very soft, that is in inverse ratio to the amount of pedalling.

It is most important that this should be clearly understood as the writer has found, from a large experience, that most people think that, when they depress the buttons to get soft effects, they should pedal lightly. This seems quite natural until it is explained to them. Pushing down the button lowers the hinged valve inside the auxiliary equalizer and thus restricts the reduction of air pressure to the power pneumatics; therefore the harder we pedal the auxiliary equalizers, or expression bellows, are collapsed more, allowing the hinged valve inside to drop nearer the port hole thus reducing the tension in the power pneumatics and causing the notes to be struck with less force.

Some makers use a different method of getting tone gradations, such as, for instance, a celeste pedal, i.e. a piece of thin soft felt resting in front of the hammers of the piano, which is in two sections, each controlled by a small pneumatic, attached to either end of the piano, which, when deflated, brings the section down into the strike line of the hammer; there being two buttons, either or both sections can be brought into action at will, with the result that, as the piano hammer strikes the string through the felt, the felt being interposed between the string and hammer, the tone is softened. Another form of softening the tone is got by reducing the striking force of the hammer by raising the hammers towards the strings. This is known as the half-blow.

The rail on which the hammers rest, and which, in ordinary pianos, is operated by the soft pedal, is carried towards the strings by two pneumatics, similar to the two used in operating the celeste pedal method, the hammer rest in this case being divided into two sections.

The writer has seen this idea carried further by dividing the hammer rest into several sections, but this was too complicated for the average player pianist; a much better result is now got by using an *automatic control.*

The *modus operandi* is as follows—The pneumatically controlled soft bass and treble auxiliary equalizers are controlled by a lever usually placed near to the buttons; when the lever is at "on" the two auxiliary equalizers are in action producing a low tension. In the tracker bar are two extra holes, one on either side, each controlling the left and right hand auxiliary equalizers respectively. If the roll in use is one in which the theme or melody is cut, every time a note is to be accented there will be a hole in the paper corresponding to the hole in the tracker bar, which will admit air, and automatically and pneumatically release the auxiliary equalizers, thus instantly raising the tension from a lower to a higher power, thereby increasing the dynamic force of the blow of the piano hammer. This form of accentuation is purely arbitrary, as it merely reproduces the ideas of the person who arranges the music. Some rolls have the phrasing arranged for, which is quite good in the case of those who have no individuality or conception of how a piece should be rendered, but, where one has a soul for music and, by the deft use of the phrasing levers and pedals, one can give an individual rendering, it is more satisfying and gives endless pleasure to the performer. Have you ever listened to Caruso, Melba or Tetrazzini on a gramophone? Although an exact reproduction is given, at the end there is no spontaneous applause: Why? because there is no living entity there. The wonderful fascination of the player-piano lies in the fact that there is the human operator—the personal element.

The writer some few years ago came across a player-piano designed by a Mr. Trist. It was a pneumatic player-piano with an electric action installed, which actuated the notes of the piano independently of the pneumatic action. The music roll was cut exactly to score, the paper was backed by a metallic substance, which was very thin and most pliable, making the paper unshrinkable ; thereby doing away with any cockling or buckling or long notes or slits which is so apt to cause hideous discords. (Contiguous cutting also does away with cockling.) There was a comb or brush with small hair-like teeth in front of the tracker bar ; the roll travelled between the tracker bar and the brush ; the moment the teeth touched the metallic substance a magnetic contact or circuit was created, thereby causing the notes to play. When any note, or series of notes, was to be accented, a hole was punched through the metallic substance, thereby allowing air to pass through the hole, or holes, in the tracker bar, thus causing the full force of the pneumatic to act on the note or notes of the piano. This obviated the necessity of cutting the note to be accented in front of or a fraction behind the accompanying chord as in the ordinary automatic accentor. In the " Trist " action the chord could be played simultaneously with the accented notes. Up to the time of writing the writer has not heard of this instrument being marketed. Some player-pianos have a *pneumatic sustaining pedal.* This requires an extra hole in the tracker bar, and when the sustaining pedal is in operation there is a hole in the paper corresponding to the hole in the tracker bar. The hole is on the left-hand side of the tracker ; this also is arbitrary. Some players also have a lever which operates the sustaining pedal mechanically, and, as the pneumatic one can be shut off, one can use one's own judgment as to when to use the sustaining pedal. It is of paramount importance that the greatest discretion should be exercised in the use of the sustaining pedal. It is more often abused than used.

Automatic Roll Centralizing Device. The eighty-eight note tracker bar having nine holes to the inch as against six to the inch in the sixty-five note tracker bar, both bars being the same in length, it follows that the holes in the eighty-eight note tracker must be smaller; therefore, should the paper oscillate laterally, there will be faulty repetition. In order to overcome this most manufacturers equip their instruments with a centralizing device which acts automatically, there being a hole at either side of the tracker bar communicating with a valve box, sometimes placed on the top of the music receptacle and sometimes on the left-hand side of the music receptacle and on top of the case containing the primary valves and striking motors; attached to this valve box are two small bellows, one on either side; a small rod is attached to each of the bellows and these again are connected with the gearing; therefore, should the roll when playing forward move to the left the hole on the right-hand side of the tracker is exposed, and a pneumatic collapses one of the bellows which pushes the gearing, i.e. take up spool and feeder spool, over to the right. Should the paper run to the right the left-hand side hole in the tracker will be exposed and the other bellows collapsed sending or pulling the roll back to the left or, in other words, the roll will be centralized. In some cases the bellows spoken of are connected to either end of the tracker bar itself, instead of to the gearing; the tracker bar moving to left or right as required to centralize the roll. The movable tracker bar can only be used where rubber is used for the tubes from the tracker bar to the primaries. Should this centralizing device fail to act, the probability is that dust has got into the aperture of the tracker bar or into the bleed hole; if so, first try to suck the dust back through the hole in the tracker bar. Small suction pumps are to be had for the purpose. If the dust is in the bleed hole, take the face board off the valve box, to which are attached the two collapsible bellows, and with a *very fine needle* probe the bleed hole gently, taking *great care not to enlarge the hole,* which would be fatal. Should such an accident happen, it will be necessary to glue on or seccotine a piece of thin card and bore a new hole with a *fine* needle or a fifty-six gauge drill. When removing the rubber tubes from the valve box *only deal with one at a time,* for if they should, accidentally, get crossed the whole gearing would be thrown out of order.

CHAPTER V

PEDALS, EXHAUSTER UNITS AND EQUALIZER MECHANISM

In Fig. 1, F, the exhausters will be seen in position, also the pedal mechanism and equalizer. Different makers have different methods of fixing and placing this mechanism, but, wherever placed, the functions are the same in all instruments using the exhaust or pneumatic system.

Behind each exhauster bellows is placed a powerful V shaped spring which keeps the exhauster closed or collapsed while the instrument is at rest, but, as soon as we begin to pedal, the exhausters open and close alternately.

In front of and attached to the main trunk exhaust channel is the equalizer. Inside the equalizer is a strong V shaped spring to keep it expanded when the exhausters are at work, and, during the hiatus between the thrusts of each pedal, the equalizer acts as an auxiliary exhauster to keep a regular reduced air pressure. Without the equalizer, as explained in an earlier chapter, there would be a fraction of a second when the exhaust would be at rest because of the momentary pause that elapses in the alternate thrust of the pedals, and the notes would not be played; therefore, it shows how essential is the equalizer. Some player-pianos have two equalizers; others, one only. It will usually be found that those with one are single valve actions, while those with two are double valve actions. When the valve or pneumatic action is in direct connection with the exhausters, and not through an auxiliary equalizer, the springs in the equalizer and those behind the exhausters are usually of much lighter tension, and therefore more sensitive.

Where an auxiliary equalizer is used to govern the fluctuation of reduced air pressure from the valves, it is usually placed on the top right-hand side of the main exhaust trunk channel to which the exhausters and equalizer are fixed. Where the valve chest is divided into two compartments it is necessary to have an auxiliary equalizer for both compartments. There must always be an auxiliary equalizer to govern and steady the motor. This motor governor is placed on the right-hand side of the main exhaust between the gate box and the motor.

CHAPTER VI

SOME TROUBLES THAT ARISE AND HOW TO REMEDY THEM

Faulty Tracking. This may be caused through the roll being turned up at the edge; if so, unwind the roll on a flat board, turn back the turned in edge, and iron it over with an ordinary smoothing iron. Or, one of the flanges, perhaps both, may be loose and the paper allowed too much lateral motion; play the roll through to the end, lift out the feeder spool, put a little glue or seccotine in between the flange and the spool, press the flanges close to the spool, put the roll into the instrument again, let it stand for a short time, then rewind it back off the take-up spool on to the feeder spool; or, the tracking device may be out of order; to test this, play forward slowly a roll which is in good order, push the metal tracker bar to the left; if it returns then that side is right; now push it to the right and, if it does not return, then that side is at fault. Of course, both sides might be wrong; to correct this take off the tube leading from the tracker bar to the valve box of the shifter—*one at a time, please!*—or you will get into trouble by mixing them. Blow through the tube, cleaning out any dust or fluff which may have lodged either in the tube or in the hole of the tracker bar, replace the tube, then test again and see if the tracker bar moves back to position automatically; if not, then take the cap off the valve box, see that the vent or bleed hole is free of dust, see that the valve is bedding and also see that the puff or pouch clears the valve; there should be about $\frac{1}{16}$ of an inch between the pouch and the valve.

One tracking device has sieves to catch dust particles. Make sure that the rod connecting the two pneumatics and the lever connecting the tracker bar are free but with no lost motion. Should the player not have an automatic tracking device, adjustments can be made by moving the take-up spool, there being a screw for the purpose on one side and a strong spring on the other.

If, as sometimes happens, the holes are exactly opposite each other in one section (treble or bass) and only half exposing the holes in the tracker bar in the other section, remember it is better to compromise and give the treble section the benefit, as runs and trills are generally in the treble, and therefore the greatest exposure of the aperture in the tracker bar. Here we would point out the paramount importance of purchasing the best quality rolls only. There is so much in the quality of the paper used. Some paper is of such poor quality that it readily absorbs moisture, and swells to an alarming extent, with the result that the music will not track. Should this happen, place the roll in a very hot oven to shrink it.

Faulty Repetition or Notes not Speaking. This may be due to dust particles being drawn in through the tracker bar and lodging in the bleed hole; if so, first see that the hole in the tracker bar is clear, then take off the tube cover which is just over the tracker bar; this will allow you to get at the tubes, and, if they are of rubber, take off the one corresponding to the note not speaking, alternately blow and suck it. If the valve is working you will hear and feel it. If it is of the double valve type this method is not so suitable. It is better to take the face board off the valve chamber (Fig. 2), thus exposing the pouch board; get a piece of *very fine* wire and probe gently each hole. Should, by accident, the bleed be made too large, which is bad for repetition, glue a piece of cardboard over the hole and make a new one. We should here remark that it is just possible the note in the piano action may be wrong, the hammer too tight on its centre causing it to act sluggishly or not at all; therefore, always examine the piano action first before taking the player action to pieces. The writer has found the following trick worth trying, i.e. put in a tester roll and play it through till you come to the note not speaking, stop dead on the note, get a piece of rubber tubing about the size used behind the tracker bar, place one end over the hole and alternately suck and blow by the mouth, at the same time pedalling to create a complete exhaust. This will oftentimes clear the dust particles away and cause the note to speak.

Notes Always Playing. Sometimes a note will remain in operation even although the hole in the tracker bar is covered; this proves that there is atmospheric air entering somewhere between the tracker bar and the bleed, or it may be that a particle of dust is preventing the secondary valve from bedding properly, or the pouch or puff may not be collapsing sufficiently to allow it to clear the button or valve. First examine the tube just behind the tracker bar at the point where the tube is attached to the metal nipple of the tracker bar; this may be split—if so, cut the split piece off and connect up again or, if there is not enough tube to allow a piece to be cut off, repair as you would a bicycle inner tube. If the secondary valve is not bedding, clear the dirt off the face. Should the pouch be too tense and not collapsing sufficiently to leave a space between the pouch and the button, rub some good powdered French chalk into the skin and this will restore its mobility. It is absolutely essential, when screws have been removed temporarily, that the same screws should be put back into the holes they came out of, and should they be overturned *do not put in a longer screw,* as great damage may result therefrom; rather plug the hole and rebore it. Make sure all screws are tight, always start screwing from one end, taking every screw alternately.

Two Notes Speaking at Once. This may be caused by the paper buckling, or air passing from one pouch to another, or one valve to another. This had better be attended to by an expert. Rolls which have contiguous cutting are free from buckling troubles as a rule.

Soft Stop or Levers not Acting Properly. When the stops or buttons or levers fail to make a discernible difference between pianissimo and forte the probability is that the valves or slides inside the expression box are not closing properly; in that case, open the expression box and, if slides, see if they are warped; if so, paper the face of the slide with fine glass-paper on a perfectly flat surface; rub on some graphite, polish with a piece of fine leather, and replace. If a valve, clean the face of the valve, see that the wires are not bent and that the fibre buttons have not moved and that they are not overturned and have lost their grip.

Soft Stops Acting Continuously. Sometimes the soft effect is continuous even if the buttons or stops are not depressed, this is most probably caused through a leak in the tube leading from the stop or button to the expression box. It most frequently happens at the nipple; if there is sufficient rubber tubing cut off a piece and replace, otherwise it may need a new length of rubber. It might possibly be the small valve just under the press button which is not bedding properly; if so, take the pallet out, clean the face of it and replace, at the same time making sure that the spring which holds the pallet is strong enough. If the instrument has a slide, the trouble may be caused by the wire becoming detached. Should, when playing softly, some notes sound louder than others, the probability is that there is a leak in the solo device; if so, proceed as in other leaky tubes, but always see that the fault is not caused by wrong tracking of the roll.

Notes Speaking on the Re-wind. This is caused by the slide valves in the cut-off boxes not covering their ports fully when the re-wind lever is thrown to the extreme left.

Should the motor slow up on pumping, the motor control spring wants strengthening, but before doing this see that the top brake is not pressing too strongly on the wheel, also slip the chain off the sprocket wheel which runs between the motor and the gearing and see if the motor runs freely without any load. Never under any circumstances put oil or grease on the motor slide valves, or their seats, nor must oil be allowed to get on the rubber tubing. See that the arms on the crankshaft are free but not loose. The crankshaft should have a little lateral movement. If the slide valves and runners are scored with grit, clean them, fine sand-paper them on a flat surface, and burnish them with graphite.

Leaks. These are generally caused by wood shrinking or screws loosening; therefore, see that all screws are tight and not overturned; if overturned, plug the holes and rebore; *never use a longer screw*, as great damage may be caused thereby. To locate a leak, get a piece of rubber tubing, hold one end to the ear and run the other end over the various parts where a leak may be likely to arise; in this way you will be able to hear the air as it rushes out. In order to find out whether the upper or lower action is leaky, disconnect the motor action and lift out; when replacing the action, put the treble end in first and then swing in the bass end, placing the action on the support blocks which are fixed on the key bed. The action should be tipped forward slightly to allow the strikers to get under the whippen and pushed well home.

To Take Out the Bottom Action. Remove screws from the support irons, disconnect all wire connections, see that the treadles are tipped up, disconnect all rubber tube connections, draw the action forward a little and lift sufficiently to clear the toe rail and lift out. You will then be able to see that the screws are tight in the cap of left-hand equalizer and that the palate leathers on the back of each exhauster is clean and lies flat on the exhausters.

Care of the Transmission Gear. This is placed on the right-hand side of the spool box and transmits motor power to the music spools. This mechanism requires occasional lubrication with fine clock oil, care being taken that the oil does not get on the cloth bushings. Graphite is the lubricant for the cloth bushings. Should the sprocket which meshes with the pinion bind, or become noisy, they require re-adjusting. The best plan is to re-set the shaft of the pinion so that a fresh part of the pinion and sprocket or large gear will engage. The bracket of the take-up-spool is usually slotted to allow for this adjustment.

Care of the Brake on Gear. This brake is to prevent the music roll from running loosely; the friction should be sufficient to cause the roll to run smoothly and hug the tracker bar; should the friction be too great it will act as a drag on the motor. The brake spring can be strengthened or weakened as required. *Never use oil* for the brake wheel; as a lubricant, rub a little French chalk or graphite on the face of the brake.

To Clean or Regulate Secondary Valves. Take off face board of lower secondary pouch board and remove the screws in it, this will expose all the secondary valves and pouches; the pouches are the reverse side of board. Should any special note be affected, count the holes in the tracker bar, beginning at the bass end, then find the corresponding note in the secondary valve chamber, remove screws in metal cup and prise it up with a knife blade, clean cup and valve, then replace them, putting a little seccotine round the part where the cup rests, and screw down. To regulate the valve, put a straight edge across the valve box, pull up the valve close to the cup; in this position the button should project $\frac{1}{16}$ inch beyond the under edge of the straight edge. There must always be $\frac{1}{16}$ inch play between the button and pouch; if there is not sufficient play, grip the valve stem with a pair of small pliers in the left hand and with the right screw the button in or out as required. When the pouch is inflated and the valve pushed up there should be $\frac{1}{32}$ inch air way between the cup and the valve.

To get at Primary Valves. First remove top action, then take off groove board in front of and just under spool box, take out screws from the tubing channel board at the back of the action, remove screws on bottom of spool box, then the tubing and spool box will come away—*do not force anything*—in one piece; this will expose the primary pouch and valve board, to remove which take out the few screws holding it. Should there not be sufficient play in the valve it will be necessary to disconnect the button from the stem to adjust the play, then re-glue; but this is a delicate operation and is best left to an expert. Beyond clearing dust particles from the seat of the valves, it is seldom necessary to do more.

To Regulate Player Action to the Piano Action. Proceed as follows: Remove player top action, take out screws in tube channel board, also out of bottom of spool box, lift off and put back valve channels into the piano, pushing it well home while canting it slightly forward at top. One will now be able to see the relative position of the striking motors to the piano action. If there is any " lost motion " or space between the striking motor and the point where it lifts the whippen, it may be necessary to undo the supports that the top action rests on, at either end of the keyboard, and pack them up with thicknesses of cardboard. When doing this do not take the screws of the supports right out, merely unscrew them a little bit, otherwise the position of the supports may be altered. Some player actions have a regulating rail; however, it will be an easy matter to see what is required to be done in order to adjust the strikers. Should some of the hammers of the piano not be resting on the hammer rail turn the regulating screw back until the hammer rests on the rail.

CHAPTER VII

MAXIMS FOR PLAYER-PIANO OWNERS

ALWAYS make certain of what is wrong before taking an action to pieces.

It is seldom necessary to take a player-piano action apart because a note won't play or repeat.

If it is found necessary to take the action apart, *Don't hurry!* Examine step by step carefully.

Always note particularly what connection any tube goes to, in what hole any wire is placed and the relative position of nuts or fibre buttons before disconnecting, as it will save endless time and trouble.

See that all tubes are properly connected.

See that all screws are tight and not overhauled, especially in the bellows and in front of the top action.

Don't pump too hard.

Don't oil the motor slide valves; use a little dry graphite instead.

Don't let oil get near wood, felt or rubber.

Don't experiment.

Don't forget to move the tempo or re-roll levers according to whether you want to play or re-wind.

Don't place the player piano too near a fire, excessive heat or cold is bad for the instrument.

When notes are silent, examine the piano action first.

When hammers remain up at the strings it may be a tight centre in the piano action.

Keep the music rolls always in a dry warm place.

See that the music is rolled up tightly on the spool after playing.

Use the sustaining or loud pedal sparingly. A good rule is to bring it on at the beginning of the bar and off at the end of the bar.

Begin trills softly and slowly, increasing towards the middle and tapering off towards the end.

Aim always at getting soft effects, power is easily obtained. The beauty or artistic value of the player-piano is never really appreciated till the player can produce the most delicate and light passages perfectly.

CHAPTER VIII

THE MUSIC ROLL

As it is sometimes necessary to refer to the pianoforte action in its connection with the player action, we here show a diagram of an upright pianoforte action in its simplest form. The names of the parts are as follows—

b is the hopper or jack, *c* is the notch, *d* the hammer-butt in which is inserted the hammer shank, *e* is the hammer head, *f* is the check, *g* the damper, *h* is the set-off button held by a rail, *i* is the hopper or jack spring.

In the higher upright pianoforte actions it is sometimes necessary to have a prolonge or pilot to connect up the key with the whippen, *p* is the prolonge or pilot, *r* is the whippen, *s* is the capstan screw, *t* is the hammer rest or rail, *w* is the tape which is tightened by the rise of the hammer when the key is struck, so as to pull the butt back and the hammer with it, when the key returns after being released, in this way assisting repetition.

The Music Roll. This is usually made of manila paper and 11⅜ in. wide.

In preparing a master sheet, the paper is stretched out on a board; parallel lines are drawn, each line corresponding with the centre of the hole in the tracker bar. The arranger then, by means of a scale, pencils the notes to be punched out. According to the speed at which the piece has to be played the arranger decides upon the relative length of the perforation. As a rough example, we shall suppose a semibreve to be one inch in length, then a minim would be half an inch, a crotchet quarter of an inch, a quaver an eight of an inch; and so on.

Whatever length is decided on for the semibreve, according to whether the tune is quick or slow time, the foregoing relative proportions remain the same. When the master sheet is ready, it is then taken to the person in charge of the perforating machine and the punches are set accordingly.

There are *record rolls.* In the case of these, a pianist plays the piece on a recording instrument and, as he phrases the piece in playing, so is the copy marked, including the use of the sustaining pedal. All pauses, retards and accelerations are recorded. This is useful in the case of those learning a piece for the first time, but, having got an authoritative idea of the manner in which the piece should be phrased, one should then get an unphrased roll and try to put one's own individuality into the rendering, which is vastly more interesting.

In one instrument on the market it is possible to reproduce the light and shade, accents, force of blow, in fact an absolute tone picture.

In order to guide the musically uneducated, different makers of rolls use various markings, the metrostyle, the artistyle, etc. Some print the words of songs. All are useful.

At the time of writing there are, especially in England, sixty-five and eighty-eight note rolls in circulation, but soon the eighty-eight note rolls will become universal, as it saves mutilating compositions which exceed the sixty-five note compass; besides, all parts of player-pianos can then be standardized.

At a conference held in Buffalo in 1909 it was unanimously agreed to adopt the scale of nine perforations to the inch, eighty-eight note scale; the sixty-five note scale is six perforations to the inch. Some makers have what is known as contiguous cutting in long notes, that is instead of one long perforation or slit, several

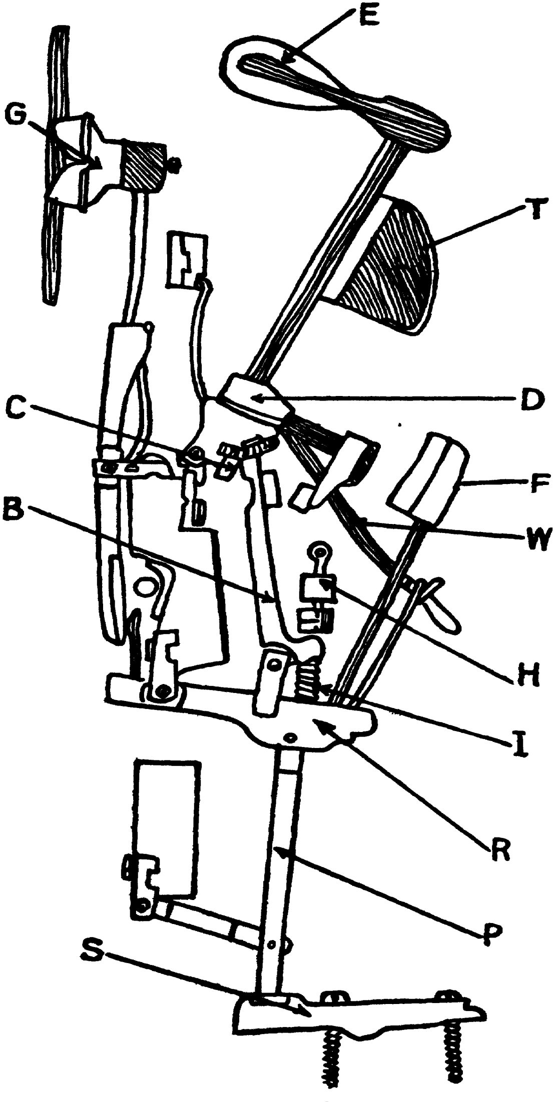


Fig. 3

closely cut perforations are continued the full length of the note. This is a decided advantage as it prevents cockling or buckling, a most disagreeable and irritating thing.

From what has been said in the preceding pages, and granting that every point has been clearly understood and mastered, step by step, we should reasonably assume that the reader has a pretty fair knowledge of the instrument he is dealing with and be in a position to get the best out of it.

CHAPTER IX

INSTRUCTIONS FOR USING THE TEMPO AND NOTE TESTER ROLL

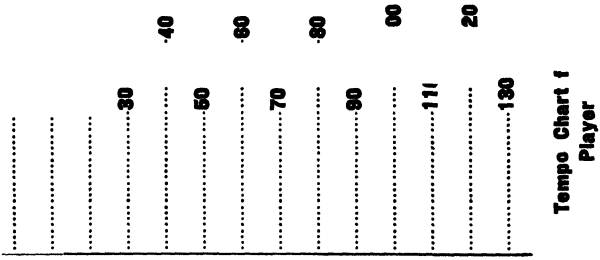
SHOULD there be any *fault with your piano-player*, such as the auxiliary equalizers not doing their work efficiently, the tempo numbers marked on the music roll are rendered useless; consequently, the proper rendition is not given to the composition, and in many instances the music roll is condemned as incorrect, whereas the instrument is at fault.

In order to enable the users of piano-players to test thoroughly the tempo lever of their instrument, we recommend the use of a tempo and note tester roll.

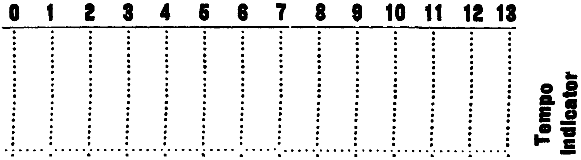
The following is the method of using—

Place the Tempo and Note Tester in the player, then set the tempo lever to Fig. 70 and pedal evenly. With your watch ascertain if seven red lines pass over the tracker board in one minute, if so, the instrument is properly adjusted; of course, at 80, there should be eight lines per minute, and so on.

To Correct Errors. Assuming that the instrument is not indicating the right number of lines a minute at which the tempo lever is pointing, place a piece of blank white paper over the indicator board. When the correct position of 70 is found, place a mark thereon, and go over each number separately, according to the diagram on page 52, until all the correct positions are marked.



These figures represent the number of feet a minute the music must travel to be in accordance with the correct reading of your tempo indicator.



Then the indicator of the instrument will correspond with the numbers on our music rolls, and fully prove that they are correctly marked according to the score.

The Method of Testing the Repetition of the Notes. Place the tempo lever at eighty and pedal slowly, when each note should strike or repeat evenly six times in succession. This will prove that the instrument is in perfect order; any note not repeating six times accurately will be a clear proof that there is some foreign matter in the valve, which can be immediately removed by the use of a dust extractor.

Having gone carefully over all the notes, run the tester roll at a greater speed than eighty to ensure that the valves are giving correct repetition.

Careful attention to the foregoing points will indicate when the valves are acting correctly. If the tempo of the instrument is correct, a perfect rendition of the various compositions will result.

It will be apparent that it may save sending for an expert mechanic (very often at a great expense), as one can correct these faults with very little trouble.

Special Warning. We would respectfully urge all owners of player-pianos not to allow anyone to tamper with the instrument, unless they are expert or are thoroughly conversant with their construction and the science of pneumatics ; more harm than good will be the result of allowing an inexperienced person to meddle with them.

CHAPTER X

THE PLAYER-PIANO IN ITS CAPACITY OF MUSIC MASTER

THAT music has a refining influence is such a common truth, it seems almost superfluous to enlarge upon a fact so generally admitted. Music is the only art which enjoys the happy prerogative of being unable to express low, vulgar, or evil sentiments; when it is cultivated with love and fervour it stifles evil passions, elevates and purifies the soul.

Shakespeare in "The Merchant of Venice," Act V, Scene 1, says—

"The man that hath no music in himself,
Nor is not moved with concord of sweet sounds,
Is fit for treasons, stratagems, and spoils;
The motions of his spirit are dull as night,
And his affections dark as Erebus:
Let no such man be trusted;"

Although music exercises such a wonderful spell, the opportunity has not been given to everyone of hearing and cultivating its boundless charm and ennobling influence. The reason, in some cases, is that there was no piano in the home, but, in the majority of cases because, although there was a piano, the technical or mechanical difficulties of fingering were so great as to make learning to play the piano laborious, uninteresting and in many cases impossible; moreover, each succeeding decade added greater technical difficulties and more complex harmonies to unravel, until it seemed as if none but geniuses and virtuosi could ever hope to revel in the modern productions, or in the masterpieces of the old school, the sublime inspirations of Mozart, Bach, and of Beethoven. Happily all this is changed. Years ago it was realized that the mechanical part of piano playing, i.e. fingering, was an almost insuperable barrier to many who desired to become pianists and, as a consequence, the piano-player in cabinet form was evolved. This was hailed with delight. (The writer well remembers the look of wonder, joy, and ecstacy which the people evinced upon hearing " William Tell " overture, Mendelssohn's "Andante Capriccioso," and Beethoven's "Moonlight Sonata " played for the first time with a piano-player as the medium.) This did duty and fulfilled its purpose for a time, until people began to object to the clumsy appearance of the player in front of the piano and the fact that it destroyed the ivories and injured the touch; consequently, the player-piano with the pneumatic action inside the piano, making a *complete piano,* was designed, thus economizing space and doing away with the possibility of injuring the keys and piano action and giving finer results as regards touch, tone and repetition.

It is a self-evident fact that in order to create a beautiful tone picture one must not be pre-occupied with mechanical difficulties, such as fingering complicated passages; hence the inestimable value of such an instrument as the player-piano with its faultless human technique. Freed from this pre-occupation, the player identifies himself completely with the work he is interpreting, has a fuller command and a better grasp of its character, style and colour, and plays the piece certainly more artistically than would be otherwise possible. He can be literally absorbed in the delicious harmonies, listen to every note struck and gloat over chromatic chords, resolutions and progressions, and become engrossed in his piece like an actor in his rôle. To give free play to the imagination, to allow the heart to be moved, to attain an ideal interpretation, and to bring out—coax out—*the melody which is echoed from the soul*, one must be freed from the mechanically difficult operation of fingering.

Supposing a professor of music is busy teaching from early morn till late at night. He cannot possibly keep abreast of the times, keep up his technique and be thoroughly conversant with the latest classical compositions; consequently he falls out of the running. Fortunately, the enduring music master—the player-piano—obviates such a fearful contingency. What a joy and comfort to the doctor, lawyer or commercial man who, after a long day, tired and jaded, comes home and sits down in the bosom of his family, puts on a pipe or cigar and is able to divert his thoughts into the most delightful channels and give joy and pleasure to all around him!

Before the introduction of the player-piano the only chance people had of getting familiar with high-class music was by hearing good artists at usually great intervals *and expense.* Now, with a player-piano installed in the home, one can have an increasing library of ancient and modern works without having to pay regard to technical difficulties and thus become musically educated at home and able to appreciate orchestral and other concerts to the full; one can become, then, an intelligent listener. As an accompanying instrument the player-piano is an invaluable adjunct to the home; anyone who plays the violin, or sings good class songs, knows the great difficulty in having the accompaniment played, on account of the increasingly complex harmonies introduced into modern violin and vocal music. Accompaniments are now cut for all standard classical pieces as well as the popular ones. Also, rolls are done with the accompaniment and words of songs, and, if one aspires to a pianoforte concerto to play with an orchestra, this also can be had. In fact the uses of the player-piano as a music master are endless and of the highest educational value.

CHAPTER XI

HOW TO PLAY

IT is necessary to state here that every maker of player-pianos has his own idea as to the disposition of the various levers or buttons; consequently the first thing one must do is to get a clear idea as to the position of the levers or buttons. Some makers prefer levers as being easier to manipulate—others think buttons better fill the purpose.

Having got the position of the levers or buttons off by heart, so to speak, one must then arrange the fingers of both hands so as easily to control each lever or button. The writer has found it most convenient to rest the finger tips lightly on the rail through which the levers or buttons come up, with the tempo lever between the first and second fingers (complete mobility of the fingers must be maintained). The two most important things in playing are control of the tempo lever and pedalling. Generally speaking, one should pedal with the front portion of the feet resting on the pedals—the toes become as sensitive to touch as the tips of the fingers—and, as touch in piano playing in conjunction with variation of tempo is the means whereby one gets variety of tone colour, it naturally follows that one must devote all one's attention to the tempo lever and pedalling. It is therefore advisable to put in a piece and play it through several times without altering the time until one can keep a high tension without much effort. Then practice letting the foot pressure down to almost nil, and suddenly with rapid strokes bring the tension up to its maximum.

The roll should be one with a fair number of notes or chords, the overture to "Tannhäuser" for instance; nearly every expert player uses one foot more than another for accenting—some the left, others the right—either does equally well. Having practised this form of pedalling until one can do it unconsciously, next practice throwing the tempo lever from right to left and *vice versa* without letting the points of the fingers move from their point of contact with the lever rail, the lateral movement or oscillation being from the wrist. Having become fairly expert at this, practice throwing the tempo lever from, say, moderato on the tempo dial to andante, and back to moderato instantly, making as before the finger tips the fulcrum. When one has mastered the blowing or pedalling and the deft use of the tempo lever, one is in the position of the pianist who has mastered the dynamics of fingering, and, as a *good* player-piano is capable of producing every degree of dynamic force from the finest pianissimo to the strongest fortissimo, it will be readily understood what enormous control the player has at his command when he adds to this his absolute control of tempo. Having got so far, the pupil should now take the same piece—overture to "Tannhäuser." It will be seen that there is a note or perforation just preceding a chord, or series of perforations. The pedal pressure should be moderate at the single note, and just as the first chord or series of perforations in a straight line are opposite the holes in the tracker bar, give a sudden thrust with either foot, at the same instant bringing the tempo lever to the extreme left and quickly back again to its normal position, which will be denoted by a tempo number at the beginning of the piece; repeat this at the first of every bar. By constantly practising this for an hour or so daily for a week or two, one will gain full control over the striking force of the pneumatics which operate the piano action.

The next thing to study is the *use* of the sustaining pedal, sometimes, though erroneously, called the loud pedal. This always should be used very sparingly. In the "Tannhäuser" overture, for instance, it should be brought on simultaneously with the thrust of the foot and the throwing of the time lever to the left, and released at once in order to be ready for the next thrust of the foot at the beginning of the first of each bar. If judiciously and skilfully used, the sustaining pedal is a great adjunct to the pedals and tempo lever in producing a beautiful tone picture. By constant practice, inherent musical instinct, a constant desire to acquire light and shade, and by taking every possible opportunity of hearing soulful musicians play only can one hope to attain high artistic excellence in the art of rendering pieces on the player-piano, and above all one must try to play as an artist would with his fingers on the piano ; so many sit down at the player-piano and pedal so vigorously that all the harshness of the piano is brought out, the sound or noise becomes ear-splitting, and those in the house as well as the neighbours around curse the day the instrument came on the scene, thus bringing discredit on an instrument which, if artistically played, would be a joy and blessing for ever. Aim always at playing softly ; it is more difficult to play pianissimo than fortissimo, therefore practice the former. By playing softly the beauty of the tone of the piano is brought out—by playing loudly all the harsh overtones are brought out.

CHAPTER XII

WHAT TO PLAY

THE writer has found it necessary to indicate what pieces the student should select for study, and consequently the following rolls will form a useful selection as an introduction to the more serious compositions. If the student has practised in accordance with the instructions given in the preceding chapters he or she will or ought to be capable of giving a very intelligent rendering of the following pieces—

Arditi .	Il Bacio Waltz.
Bachmann, G.	Les Sylphes.
Bach, J. S. .	Chromatique Fantasie and Fugue.
	Organ Fantaisie and Fugue in G minor, arranged for piano by Liszt.
Bartlett, H. N. .	Eldorado, Polka de Concert.
,, .	Polka de Concert, op. I.
Batiste, Edouard	Grande Offertoire de St. Cecilia, No. 2.
Beethoven, L. Van	Sonata, op, 14, No. 2.
	pathetique, op. 13, No. 8.
	op, 26.
	op. 27, No. 2.
	op. 53.
	op. 57.
	Symphony No. 3, Eroica, piano arrangement by Liszt.
	Symphony No. 5, piano arrangement by Liszt.
Berger, Rudolph	Amoureuse, Valse Lente.
Braga .	Angels' Serenade.
Brahms, J. .	Hungarian Dance, No. 6.
Chaminade .	Air de Ballet, Callirrhoë.
	,, ,, op. 30
	Humoresque, op. 25, No.2.
	La Lisonjera (the Flatterer).
	Danse Creole, op. 94.
	Automne.
	Arabesque, op. 61.

Chaminade . .	Pas des Amphores.
,,	Pierrette (Air de Ballet).
,,	Scaramouche, op. 56.
,,	Scarf Dance.
,,	Valse Arabesque, op. 98, No. 4.
,,	Valse Caprice, op. 33.
Chopin, F. . .	Andante Spianato, op. 22 in G.
,,	Ballade No. 1, G minor, op. 23.
,,	,, in F, op. 38.
,,	,, in A♭, op. 47.
,,	Concerto in E minor, op. 11.
,,	Fant. Impromptu, op. 66.
,,	Scherzo, op. 31, B♭ minor.
,,	,, op. 39, C♯ minor.
,,	Etudes, op. 10—
	No. 3 in F major.
	No. 5 in G♭ major (black key Etude).
	No. 6 in E♭ minor.
	No. 7 in C major.
	No. 11 in E♭ major.
	No. 12 in C minor (Revolutionary Etude).
,,	Etudes, op. 25—
	No. 1 in A♭ major.
	No. 6 in G♯ minor.
	No. 7 in C♯ minor.
	No. 9 in G♭ major.
	No. 11 in A minor.
	No. 12 in C minor.
,,	Nocturnes—
	Op. 9, No. 2 in E♭ major.
	Op. 15, No. 2 in F♯ major.
	Op. 37, No. 1 in G minor.
	Op. 37, No. 2 in G major.
	Op. 55, No. 1 in F minor.
,,	Polonaisen—
	Op. 26, No. 1 in C♯ minor.
	Op. 40, No. 1 in A major.
	Grande Polonaise, op. 22, in E♭ major.
	Sonata, op. 35, in B♭ minor (containing Funeral March).
	Sonata, op. 58, in B minor.
Czibulka, A. .	Gavotte Stephanie, op. 312.
Delibes, L. . .	Coppelia, Prelude, Valse Lente.
,,	Sylvia, Pizzicato et Valse Lente.
Dvorak, A. .	Humoresque, op. 101, No. 7 in G♭.
Elgar, E. . .	Pomp and Circumstance, No. 1, Military March.
,,	

Elgar, E. .	Salut d'Amour, op. 12.
Ganz, W	Qui Vive, Galop de Concert
German, E	Shepherd's Dance from Henry VIII.
„	Torch Dance „ „ „
Gillet, E .	Echoes of the Ball
Goddard, C	Berceuse Jocelyn
„	Second Mazurka, op 54
Gottschalk, L M	Pasquinade
	The Dying Poet
	The Last Hope
Grieg	An den Fruhling, op 43, No 6
	Concerto in A minor, op 16
	Huldigungsmarsch, op 56, No 3
	Peer Gynt Suite, Anitra's Dance
	„ „ op 46, No 1, Daybreak. the Death of Aase
Henselt	If I were a bird
Herbert	Badinage
Leybach	Fifth Nocturne
Liszt .	Liebestraum
	Grande Etude de Paganini, No 3, Campanella
	Rhapsodie Hongroise, No 2
	„ „ No 6
	„ „ No 12
	„ „ No 14
	„ No 18
	Polonaise, No 2 in E
	Rigoletto, Paraphrase
MacDowell	Hexentanz, op 17, No 2 (Witches' Dance).
„	All his sea pieces, op 55
Mendelssohn	Allegro Brillant, op 92 in A
	Andante and Allegro, op 16, No 1
	Rondo Capriccioso
	Ruy Blas
	Songs without words—
	No 18, Duetto
	No 30, Spring Song
	No 1 in E
	No 34, Spinning Song
Michaels	Czardas, Nos 1, 3 and 6
Moszkowski	Arabesque op 15
	Air de Ballet, op 36, No 5
	From foreign parts, op 23, Nos 3 and 6
	Polonaise, op 11
	„ op 18, No 5
	Scherzo Valse, op 40
	Valse Brillante, A♭

Moszkowski	Valse, op. 34, No. 1.
,,	,, op. 17, No. 3.
Nevin	Narcissus.
,,	The Rosary.
,,	Water Nymph.
Paderewski	Minuet, op. 14, No.1.
Rachmaninoff	Prelude, op. 3, No. 2.
Raff	Cavatina, op. 85, No. 3.
,,	La Fileuse, op. 157.
Rossini	William Tell, Overture.
Rubinstein	Kammenoi Ostrow.
,,	Melody in F.
,,	Valse Caprice in E♭.
Scarlatti	All Sonatas.
Scharwenka, X.	Polish Dance, op. 3, No. 1.
Schubert	Serenade.
,,	All Impromptus.
Schumann	Arabesque.
	Novelette, op. 21 in F.
	,, op. 29.
	Papillons, op. 2.
	Phantasiestuck, op. 12 (Aufschwung).
	Traumerei, op. 15.
Sinding	Frühlingsrauschen (Rustle of Spring).
,,	Melodie, op, 32, No. 2.
Smith, Sydney	Le Jet d'eau.
Spindler	Husarenritt.
Tausig	Marche Militaire (Schubert).
Terschak	Murillo, Allegro de Concert.
Thomé	Simple Aveu.
Tschaikowsky	Valse de Fleurs (Casse Noisette Suite).
,,	Polacca de Concert, op. 72, No. 7.
Wagner	Die Meistersinger (Walther's Prize Song).
,,	Lohengrin (Wedding March).
,,	Tannhäuser, Overture.
,,	,, March and Chorus.
Weber	Oberon, Overture.
,,	Concertstuck.
Wieniawski	Valse de Concert.
Wollenhaupt	Hélène, Grand Valse Brillante, op. 26.
,,	The Last Smile.

CHAPTER XIII

HOW TO APPRECIATE MUSIC

As previously stated, the purpose of this book is to impart some elementary knowledge to the owners of player-pianos with absolutely no knowledge of that instrument or of music, therefore the scope of the work being unpretentious the following thoughts are expressed with all-becoming modesty.

The writer remembers being asked to go and view a picture called " The Muck Rake," by Sir Noel Paton. The friend who took him there was himself no mean artist ; standing in front of the picture the writer saw broadly a very wonderful work, but was incapable of entering into any detailed discussion of the points, inasmuch as he saw few. The friend, realizing the writer's paucity of intelligent comment, began to explain and point out the multitudinous details of that wonderful canvas, till at last the beauties of the picture began to unfold themselves before the eyes of the writer, and mere wonder became intelligent appreciation of a great work of art—and so it is with music. One hears the sublime symphonies of the great masters and it all seems very wonderful, but it conveys no definite idea to the musically uneducated. Here the province of the player-piano as an educator steps in and opens the gates to the world of music, and with a little direction one can soon begin to unravel the mysteries and complexities of music and its sublime harmonies. Of all the arts, music is the most universally cultivated, and gives infinite pleasure to the peoples of every nation.

There is no art which acts upon the emotions like music. The mother sings to soothe her child. Music has inspired the most glorious deeds on the battlefield. Every incident in life from the cradle to the grave can be depicted or portrayed in music. Who is there who has travelled in foreign lands and heard some melody of the dear old Homeland sung or played without being touched to the heart? Even the most brutal nature must at that moment become chastened and permeated with the desire to live a better, nobler and sweeter life.

The most potent factor in music is rhythm. The writer has frequently, in order to show the importance of rhythm, taken a well-known Psalm tune which had the power of creating the most devotional mental condition and played it in 3/4 time, that is three crochets to the bar or waltz time, with the result that the character of the music completely changed, and also the mental condition of the listeners, who instead of having a feeling of devotion had the desire to waltz. The time was then changed to 6/8 time, or six quavers to the bar, sometimes called, especially in Scotland and Ireland, jig time. The result was, as can be imagined, a desire to execute the steps of an Irish jig. Again the time was changed to that of the stately gavotte, when the mental condition was changed from that of abandon and gaiety to that of the courtly ladies and gentlemen of the early Victorian period. Such is the power of rhythm and its influence on the mind.

Next in importance is melody, which is usually defined as a well-ordered succession of single sounds and sometimes called the tune. Melody, when used to convey the effect of sadness, is usually built up on the minor mode, the depressed third in the scale giving an effect of sombreness. If we take the key of A minor and raise the seventh a semitone to form a leading seventh we have then a depressed third, sixth, and an augmented second F to G♯. The effect of this mode is very sombre indeed. This scale gives rise to a most beautiful chord, which is termed the chord of the diminished seventh, containing an imperfect triad and diminished seventh. If we wish to convey the effect of exhilaration, joy and gladness, it is usual to employ the major mode. The third and sixth notes in the scale being raised in the major, both ascending and descending, has a brightening effect, whereas, as we have already said, the third and sixth intervals in the minor scale being depressed, the effect is the converse and changed to one of sadness. But, again, rhythm has such a power over the emotions that it can even make a time built on the minor mode create a feeling of joy as in the case of some Irish jigs and Scotch reels that are written in minor keys ; still, generally speaking, the effect of major and minor modes is that of joy and sadness respectively.

In order thoroughly to enjoy music it is necessary to understand something of form.

Several musical phrases following each other sequentially, so as to form a connected whole, constitute a movement. The sonata is constructed of several movements, usually three or four—whether the work be for piano alone or for a trio, quartet or quintet, the form of the sonata is usually retained.

When the work is for an orchestra it is called a symphony. If, however, the work is for a solo instrument with an orchestral accompaniment it is called a concerto. The first and last movements of the sonata are always in the same key, but one may be in the major and the other in the minor or *vice versa*. The intermediate movements are usually in different keys, more or less related to one another. For instance, in Beethoven's sonata, op. 14, No. 2, the first movement is in the key of G major, and at the first double bar modulates into the key of D major, the dominant of the key G, the key in which the subject is introduced. After the first double bar the subject is developed, starting off in the key of G minor, the tonic relative minor ; in a few bars the key of B♭ the relative major of G minor, is reached, then at the thirty-fifth bar from the first double bar there is a pause (𝄐) on the dominant seventh of E♭, E flat being the sub-dominant of B♭, the key just left ; a few bars further on the movement is modulating to the dominant of the key of G, which is D, and by the use of the dominant seventh the movement is brought back to the key of G major at the sixty-second bar from the first double bar, the key in which the theme was first introduced. The movement continues in G for a few bars only, then modulates through C major, the sub-dominant of G major, back to G major and into D major at the eighty-eighth bar from the first double bar ; at the ninetieth bar we enter G major ; at the first part of the hundredth bar we are in D major ; in the second part of the same bar the dominant seventh is used to bring us back to G major again. At the 106th bar we have an example of that beautiful chromatic chord, the chord of the diminished seventh, which resolves into the key of G major in the next bar, but to show the importance of the dominant seventh in going from one key to another, even although the resolution here of the diminished seventh is fairly satisfying, and, in order to give repose, it is still advisable to go from the chord of G to its dominant seventh as at bar 108, thus giving the effect of absolute repose, rest and satisfaction. The penultimate and ultimate chords in this movement are the dominant seventh and tonic respectively, the melody finishing on B, which forms the mediant of the dominant seventh of C major, the key in which the next movement opens. This movement, the andante, is pretty straightforward. The third movement, or scherzo, opens and finishes in the key of G major, the key in which the first movement is written.

CHAPTER XIV

MEANING OF VARIOUS EXPRESSION MARKS AND SYMBOLS USUALLY FOUND ON ROLLS

THE black dotted line indicates the degree of force or volume of sound to be produced. If the dots, therefore, are on the extreme left, the softest tone is indicated, being equal to pp.; if they travel towards the right, one-fourth of the distance, the tone is to be a little louder or equal to p.; if they travel to the centre of the paper, the tone must be moderately loud, equal to m.f.; if they travel three-fourths to the right, the note is to be still louder, or equal to f. Should the dots travel to the extreme right, then the tone must be very loud, or equal to ff.

On some rolls will be found a thin red line denoting the variations of tempo, the red line radiating over the same distance as the tempo lever; therefore, if the line travels to the right, the tempo lever would have to be moved to the right; and if the line travels towards the left from a centre corresponding to the centre of the tempo dial, the tempo lever would be moved to the left also—thus the variations of tempo would be secured. This red line, however, is to be found on one maker's rolls only. The same results, i.e. variations of tempo, can be got by the plentiful use of figures, and this method is universally adopted. On most tempo dials there are numbers which correspond with the numbers on the roll; therefore if one watches the numbers on the roll and moves the tempo lever to the corresponding number on the tempo dial one gets a broad idea of what the variations of tempo ought to be, but, as we have already said, the great desideratum is individuality, and this can be cultivated by listening to good artists, studying rhythm, and practising intelligently.

Certain words are used to denote time, etc., therefore we give here a short definition of terms and expressions used in music—

M.M. 𝅗𝅥 = sixty . . . . . means that if a Mälzel's Metronome is set to beat or rather tick sixty times to a minute, the time or length of a minim (𝅗𝅥) will be equal to a tick of the Metronome.

A selection of words used in music to denote loudness and softness—

Piano or p.	Soft.
Forte or f.	Loud.
Mezzoforte or m.f.	Moderately loud.
Mezzopiano or mp.	Moderately soft.
Fortissimo or ff.	Loudest.
Pianissimo or ppp.	Softest.
Sforzando, sf. > or Λ	Forcing.
Crescendo, cresc. or <	Increasing.
Decrescendo, decres. or >	Decreasing.
Diminuendo, dim.	Diminishing.
Morendo	Dying away.
Ped.	Use the sustaining pedal.
*	Discontinue the use of the pedal.
V	To accent the note or chord.

Italian words used to denote speed—

Grave	Grave.
Adagio	Slowly.
Lento	Slowly.
Largo	Slow, largely, grandly.
Larghetto	Diminutive of Largo, i.e. less large.
Andantino	Diminutive of Andante, used by some foreign musicians to mean less slow, with others less quick.
Andante	Going.
Moderato	Moderate.
Allegretto	Diminutive of Allegro.
Allegro	Gay.
Vivace	Lively.
Presto	Quick.
Prestissimo	Very quick.

Words used to modify the time—

Accelerando	Accelerating.
Stringendo	Bringing together.
Allargando	Enlarging.
Calando	Decreasing.
Rallentando	Becoming slower.
Ritenuto, riten or rit.	Holding back the time.
Ritardando, ritard, rit.	Retarding the time.
A tempo	To resume the normal time after it has been quickened or retarded.
Ad libitum	At pleasure as regards time.
Più mosso	More movement.
Meno mosso	Less movement.

Expressions used to indicate the manner of playing the piece—

Affettuoso	Affectionately.
Agitato	Agitated.
Amoroso	Lovingly.
Animato, Con anima	Animated with soul.
Appassionata	Passionate.
Con passione	With passion.
Brillante	Brilliant.
Cantabile	In a singing style.
Colla voce	Follow the voice.
Colla parte	Follow the solo part.
Con brio	With spirit.
Con fuoco	With force, with fire.
Con moto	With animated motion.
Con expressione	With expression
Con spirito	With spirit.
Con tenerezza	With tenderness.
Dolce	With softness and delicacy.
Dolente	Plaintively.
Legato	Smoothly, connectedly.
Leggiero	Light.
Maestoso	Majestic.
Marcato	Marked.
Marziale	Martial.
Mesto ; Con dolore	Sadly.
Mezza Voce	Half voice.
Non tanto	Not so much.
Non troppo	Not too much.
Recitativo	Delivery of words with great freedom as to time.
Risoluto	Resolute.

Scherzando	Playing (playful).
Smorzando	Fading away.
Solo	Part to be played by one person.
Sostenuto	Sustained.
Sotto voce	Subdued.
Staccato	Detached
Tenuto	Held.
Tutti	Full band or chorus.

Words used in conjunction with the preceding—

A or ad	At.
Al	To the.
Assai	Very.
Ben	Well.
Come	As.
Con	With.
Da	From.
Dal	From the.
Di	Of.
Ed or E	And.
Ma	But.
Meno	Less.
Molto	Much.
Mosso	Moved (as to speed).
Piu	More.
Quasi	As though.
Sempre	Always.
Senza	Without.
Un poco	A little.

Definition of musical terms—

Minuet	An early French dance.
Morceau	A piece, composition of any kind.
Nocturne	A composition, vocal or instrumental, suitable for evening recreation.
Novelette	Composition free in form.
Obbligato	An instrumental part or accompaniment of such importance that it cannot be dispensed with.
Opera	A form of dramatic representation in which vocal and instrumental music forms the essential and predominant element.
Oratorio	An extended composition of dramatic type for vocal solo and chorus, usually having a text based on Scripture.
Overture	Musical introductory to dramatic performance.

Paraphrase	A transcription or re-arrangement of a musical composition.
Pastoral .	A composition representing rural and idyllic scenes.
Polonaise	A dance of Polish origin.
Potpourri.	A musical melody, a number of tunes being juxtaposed.
Prelude .	Introductory or preparatory to a more extended composition.
Reel .	A lively dance, probably of Celtic origin.
Requiem .	A musical service for the dead.
Reverie .	Instrumental composition of a dreamy cast.
Rhapsodie	An instrumental fantasia on folk songs taken from primitive national music.
Rondo .	A composition generally in two parts, with the principal subject often repeated.
Scherzo	Of a light, piquant, humorous character.
Serenade -Serenata-	A composition for use in the open air at night, generally of a quiet, soothing character.
Sonato	Instrumental composition in three or four extended movements contrasted in theme, tempo and mood.
Suite .	A series, a collection.
Symphony	A composition of several movements designed for full orchestra.
Tanz .	A dance.
Tarantelle	A dance supposed to have the virtue of curing the bite of a venomous species of spider called the tarantula.
Toccata .	A movement of difficult execution.
Transcription	Adaptation of a composition for some other instrument than that originally intended.
Valse—Waltz—Walzer .	A round dance in three-fourths time.
Variation .	A series of transformations of a theme by means of harmonic, rhythmic and melodic changes and embellishments.

The terms Adagio and Largo differ in their application with regard to the *character* rather than the *pace* of the movement to which they are applied.

Andantino is the diminutive of Andante, therefore signifies less going, but is sometimes used by composers to mean less slowly than Andante.

Allegro means gay, but as it is sometimes used in conjunction with words of quite an opposite character it is best to understand it as meaning quickly.

Sometimes these different terms are used in conjunction with qualifying or intensifying terms indicating the character of the music, such as allegro molto, very quick ; allegro non troppo, not too quick ; andante con moto, with movement or impulse ; presto assai, decidedly fast.

It may be useful here to state that the affix " issimo " augments the power of a word, and the affix " mo " or " etto " diminishes the power.

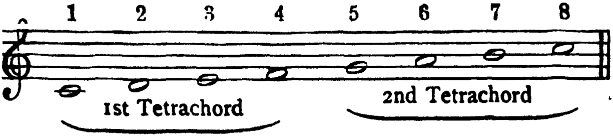
Composers usually indicate the rate at which they wish their compositions performed by the use of the metronome.

With long study and practice one can pretty well tell the rate at which a composition should be played without seeing any time mark whatever.

In order the better to understand certain terms used in the analysis of the Beethoven sonata we shall explain them here.

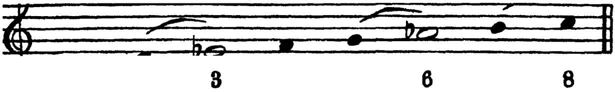
Taking the diatonic scale of C Major, consisting of two tetrachords or eight notes—

MAJOR SCALE OF C

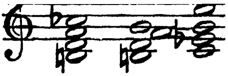


The first note is called the tonic, the second the supertonic, the third the mediant, the fourth the subdominant, the fifth the dominant, the sixth the submediant, the seventh the leading note, and the eighth the octave.

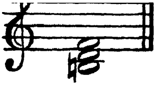
Scale of C Minor (Harmonic Form)



In the harmonic form the intervals are the same, ascending and descending. In this scale will be found all the notes contained in the chord of the diminished seventh of C minor

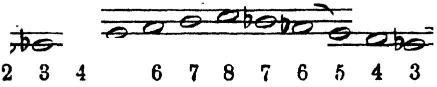


containing an imperfect triad—



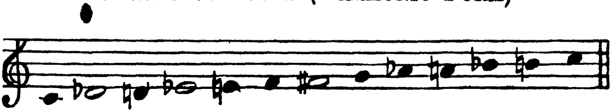
and a diminished seventh.

Scale of C Minor (Arbitrary or Melodic Form)

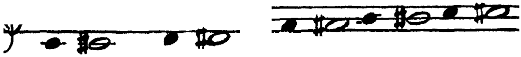


The augmented second between the sixth and seventh in the harmonic form having a hard effect in melody, an arbitrary alteration is made to secure smoothness of melody, hence the reason of the arbitrary or melodic form in which the sixth and seventh are major ascending and minor descending.

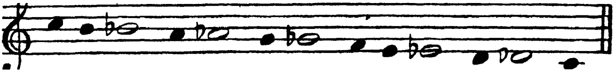
CHROMATIC SCALE (HARMONIC FORM)



CHROMATIC SCALE (MELODIC FORM, ASCENDING)



CHROMATIC SCALE (MELODIC FORM, DESCENDING)



The semibreves (𝅝) show the notes that are added to the major or minor scales.

An arpeggio is a chord in which the notes are played successively as on a harp.

CHAPTER XV

ALPHABETICAL LIST OF DIFFERENT MAKERS OF PLAYER-PIANOS

In this chapter we propose to give a short description of different makes of player-pianos as described in each maker's catalogue.

The Allison piano has been before the public for nearly a century, and Allison Pianos, Ltd., claim to have been the first company in Europe to build the combined player-piano as known to-day.

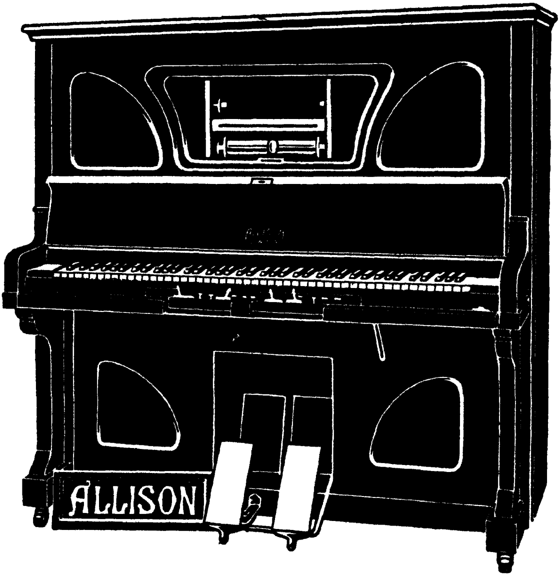
It has always been their policy to blend the Allison piano with the latest player inventions. At the 1922 Olympia Exhibition the Allisonola contained the same type of player action as supplied to H.R.H. Princess Mary, and public recitals were given in the concert hall, when it accompanied eminent vocalists and instrumentalists to their satisfaction.

The mechanism is extremely simple and trustworthy, and when using modern rolls one has only to depress two buttons to secure the melody or theme. Would-be purchasers are always requested to have a private demonstration in the use of the several devices.

Very much depends upon the pedalling, and the following suggestions will be found useful. Place the feet upon the pedals so that the heels come almost even with the lower edge. The movement of the feet should be mainly from the ankles, and the heels should not leave the pedals. To play softly the pedals must be used lightly, with strokes short but steady; for loud passages longer strokes are necessary.

Do not pedal too hard continuously, as this makes the music sound monotonous.

American Player Action Co. This firm manufactures the Stoddard-Ampico action. The action is of the pneumatic type. The bellows are electrically driven.



By the courtesy of *Allison Pianos, Ltd.*

FIG 4

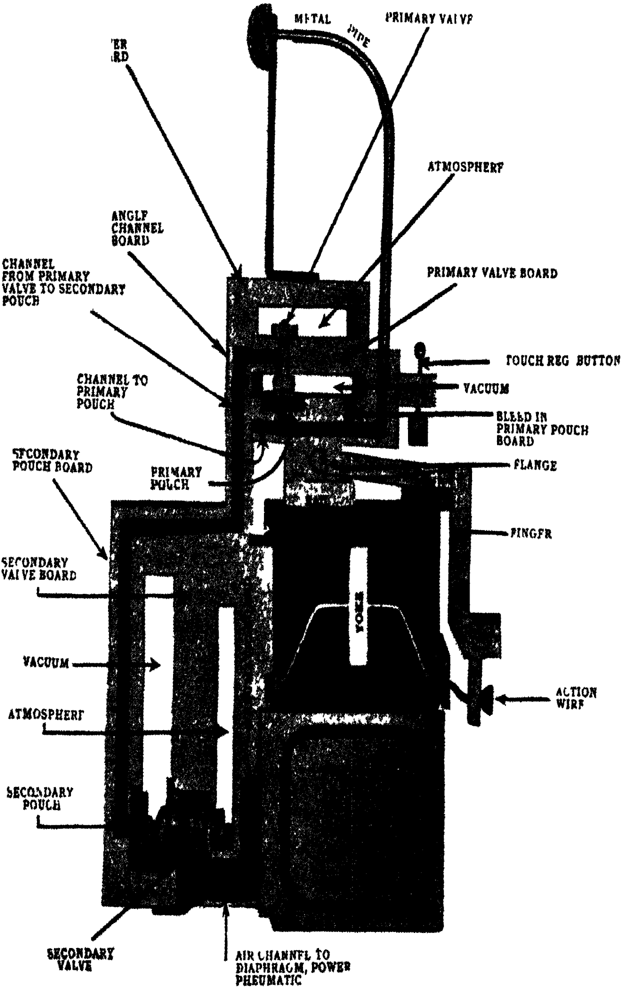
The expression boxes are such that, with a roll reproduced by a great artist, a perfect reproduction of the artist's rendering of the piece can be obtained. Expression governors can be controlled from the key slip when ordinary rolls are used. As there are no foot pedals the ordinary sustaining pedal of the piano can be used. There is an automatic re-wind. The motor is of the ordinary pneumatic type.

The American Player Action Co. supplies actions to various piano-makers. This action has two exhausters, two equalizers of high and low tensions, automatic tracking device. Four point motor, permanent meshing of large gear wheel and pinion on transmission gear.

The Amphion. Made by the Amphion Piano-player Co., Syracuse, New York. This company manufacture various models of their unit system already described in another chapter. The great advantage of the unit system is that, should any unit of the player action become defective, it can be instantly replaced by a new unit without disturbing the mechanism and without having to consider its relation to any other part of the mechanism.

This action has two exhausters and one equalizer. Foot pedals move automatically into playing position. Has automatic tracking device, pneumatically operated sustaining pedal. Single valve system. Valves are of the vertical type, six point motor, motor valves made of non-corrosive silver metal, pneumatically operated cut-out. Automatic spring tensioning device in motor governor. Divided hammer rail controlled from buttons on key slip.

The Angelus. This instrument is manufactured by the Wilcox & White Co., Meriden, Conn., U.S.A. The player action is made for grand and upright pianos. It has that wonderful device, the phrasing lever, by which every gradation of time, from a pause to presto, is under absolute control, making the playing of accompaniments a delight. It has two exhausters and one equalizer, the pneumatics are of the diaphragm kind which inflate when operating the note of the piano instead of collapsing as in other player actions. This make of instrument can be had with duplex tracker to play eighty-eight or sixty-five notes.



By the courtesy of *Sir Herbert Marshall and Sons*

FIG. 5

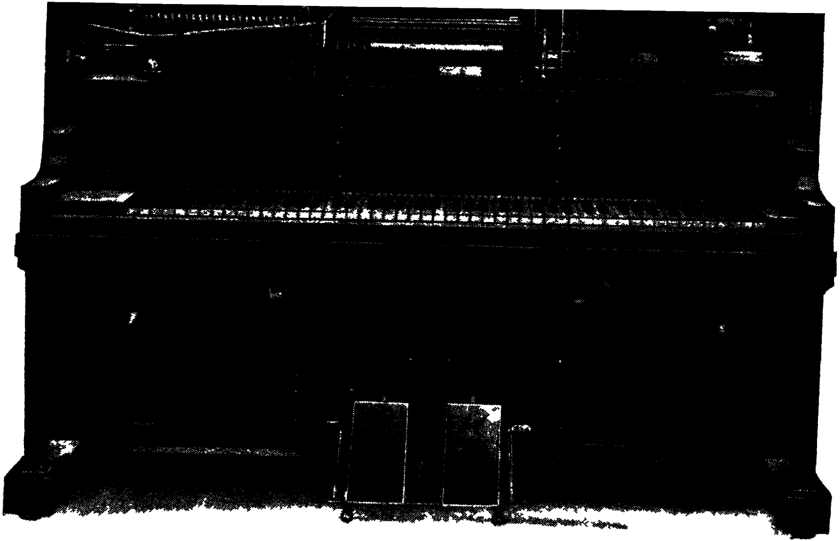
SECTIONAL VIEW OF ANGELUS ACTION

The motor is a five point one ; it has a tracking device for securing perfect tracking of the music roll.

By opening the key slip, the foot pedals fall into playing position, and by closing the key slip and pedalling once or twice the pedals return to the piano case again. The graduating accompaniment lever operates a by-pass valve by means of which a crescendo or diminuendo can be effected in the accompaniment. The Orchestral Angelus piano contains a set of reeds which can be played with the piano part or separately ; the reeds can also be played by hand from the piano keyboard or from the music roll. If required, this model can be fitted with a mandoline attachment.

The Apollo. Made by the Melville Clark Piano Co., Chicago. This firm manufacture the Solo-Apollo Grand, with or without electric drive, also the Solo-Apollo Grand with separated control cabinet. As pointed out in another chapter the Solo-Apollo has an independent action on high tension for the solo part and a low tension set of pneumatics for the accompaniment, which is the most perfect arrangement that could be devised ; an enlarged tracker bar is used with a special set of holes for the solo and another set for the accompaniment. This arrangement requires specially cut rolls, as will be easily understood on account of the special tracker bar. The writer played on an eighty-eight note cabinet piano-player of this firm's manufacture twenty years ago, which goes to show that the Melville Clark Co. was, and is, one of the most progressive firms in the player world.

Auto Pneumatic Action Co. Two exhausters, two equalizers, high and low tension, double valve type of pneumatic action, vertical primaries, flexible fingers, automatic tracking device, five point motor, double divided hammer rail, pneumatically operated.



By the courtesy of *Messrs Hardman, Peck & Co.*

FIG 6

THE AUTOTONE

The Autopiano Co. Two exhausters, one equalizer, double valve type, vertical primaries, automatic tracking device, special device for dropping foot pedals, five point motor, double divided hammer rail. Tubes are of metal, sustaining pedal operated pneumatically.

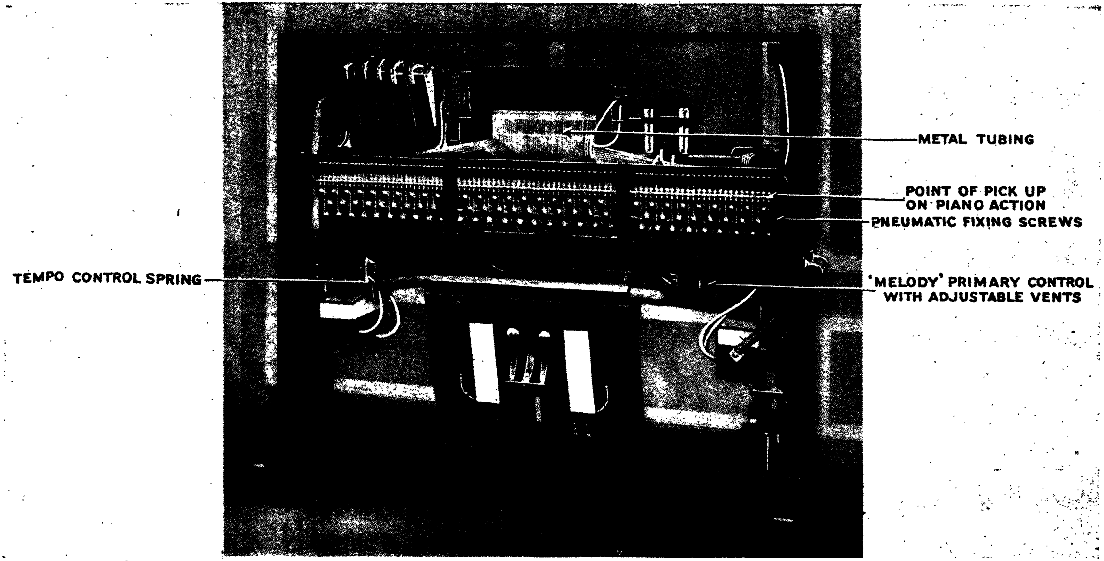
The Autotone. Made by Hardman, Peck & Co., New York. Two exhausters and one equalizer, patented folding pedals, double expression boxes and governors double valve type, metal tracker bar, transposing device, automatic tracking device, pneumatically operated sustaining pedal, six point motor of three double units. Expression boxes are controlled pneumatically by depressing buttons on key slip. The soft pedal is operated from a direct lever on the key slip which raises the hammer rail nearer the strings, thus securing a perfectly modulated gradation of tone colour. This firm also manufacture the *Playotone*, which is similar in many respects to their famous Autotone but with a single valve action. Expression is obtained by two buttons on the key slip which control a pneumatically operated hammer rail lift. The sustaining pedal is operated from a direct lever on the key slip. The tubes are of metal.

Behr Brothers & Co. Two exhausters, two equalizers of high and low tension, special folding pedals, change gears of motor outside at left of tracker bar, double valve type, primaries in pairs in a separate detachable box, vent hole is in form of small brass tube which is detachable for cleaning, secondaries are in unit form, each pneumatic is easily detached by removing board in front of action, six point motor with special valve. Divided hammer rail pneumatically operated; normally this action plays softly, and to increase tone a button is depressed. There are two buttons controlling the bass and treble expression governors; these can be locked down, and in this case the expression and accenting can be done by the foot pedals.

The Carola Player. The Carola Piano Player, manufactured in London by Messrs. Blüthner & Co., Ltd., is a new departure in this class of instrument, inasmuch as the valve system adopted is constructed on an entirely new system. Instead of the usual " poppet " valves, a small angle valve is used, which is found so effective that no primary valve is necessary. In other respects the player contains all the latest improvements, a particularly efficient solo device, a prompt working pneumatic loud pedal, a half-blow device for obtaining extreme pianissimo effects, simple tracking device, etc., etc. The blowing or pedalling of this player is phenomenally easy. The merest touch on the pedals is sufficient to strike a note.

An interesting feature from the player expert's point of view is the fact that the striking pneumatic, with its angle valve, forms a separate unit for each note, and can be removed at will by releasing two screws. This fact enables the maker to test each pneumatic and valve before the player is assembled, as it can be put on a testing bench independently of other valves and placed under full wind pressure; whereas, in the ordinary system, leaking valves are only discovered after the player is assembled.

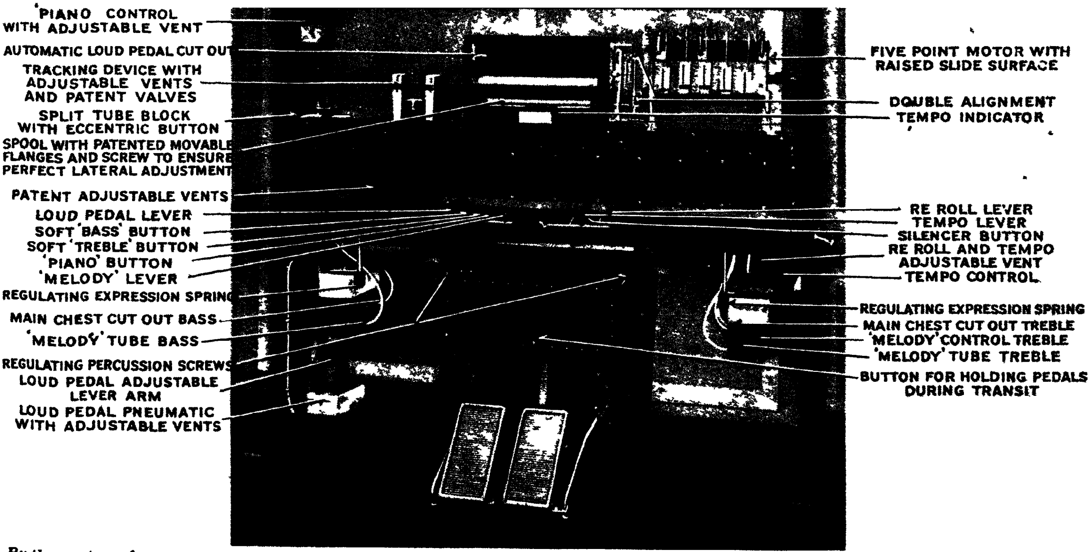
Apart from this special valve, the Carola has other distinctive features, most important of which is an adjustable vent hole, which can be adjusted by the turning of a screw without removing the faceboard of the player action. Every player expert will at once appreciate the advantage of this. The flanges on the take-up spool are adjustable to the music roll, and by the turn of a screw the whole take-up spool can be removed to the right or left, whichever may be desired.


METAL TUBING
POINT OF PICK UP ON PIANO ACTION
PNEUMATIC FIXING SCREWS
TEMPO CONTROL SPRING
'MELODY' PRIMARY CONTROL WITH ADJUSTABLE VENTS

By the courtesy of *Messrs. Blüthner & Co.*

FIG. 7

THE CAROLA PLAYER


'PIANO CONTROL WITH ADJUSTABLE VENT
AUTOMATIC LOUD PEDAL CUT OUT
TRACKING DEVICE WITH ADJUSTABLE VENTS AND PATENT VALVES
SPLIT TUBE BLOCK WITH ECCENTRIC BUTTON
SPOOL WITH PATENTED MOVABLE FLANGES AND SCREW TO ENSURE PERFECT LATERAL ADJUSTMENT
PATENT ADJUSTABLE VENTS
LOUD PEDAL LEVER
SOFT 'BASS' BUTTON
SOFT 'TREBLE' BUTTON
'PIANO' BUTTON
'MELODY' LEVER
REGULATING EXPRESSION SPRING
MAIN CHEST CUT OUT BASS
'MELODY' TUBE BASS
REGULATING PERCUSSION SCREWS
LOUD PEDAL ADJUSTABLE LEVER ARM
LOUD PEDAL PNEUMATIC WITH ADJUSTABLE VENTS
FIVE POINT MOTOR WITH RAISED SLIDE SURFACE
DOUBLE ALIGNMENT
TEMPO INDICATOR
RE ROLL LEVER
TEMPO LEVER
SILENCER BUTTON
RE ROLL AND TEMPO ADJUSTABLE VENT
TEMPO CONTROL
REGULATING EXPRESSION SPRING
MAIN CHEST CUT OUT TREBLE
'MELODY' CONTROL TREBLE
'MELODY' TUBE TREBLE
BUTTON FOR HOLDING PEDALS DURING TRANSIT

By the courtesy of *Messrs. Bluthner & Co.*

FIG 8
THE CAROLA PLAYER

Another feature of the Carola Player is the compactness of the lower action, that is the part of the player which is placed under the keyboard. A new bass string can be fitted to the piano without the trouble of removing the player.

The driving gear used in this player is finished with a dull brass finish such as is used for the metal-work of electrical instruments, and gives it a particularly fine appearance. The workmanship throughout is of the highest class, and is a credit to the British workmen employed in its construction.

The makers issue a descriptive booklet describing the mechanism and method of operating the player, which would be found very useful to a purchaser.

The Cecilian. Made by the Farrand Co., Detroit, Mich. Two exhausters and equalizers. Double valve type. Each set of primary and secondary valves and pneumatics are a distinct unit and detachable, mechanical tracking device, transposing device. Five point motor, sustaining pedal, actuated direct from lever on key slip. Expression boxes and governors controlled by buttons on key slip.

Coin Operated Player-Piano. These instruments are mostly of the pneumatic type and therefore similar in construction, but, as the exhausting must be done by mechanical means, it becomes necessary to have some form of mechanical motor to do the work of the human in ordinary pneumatic player-pianos. As a general rule an electric motor is used and serves the purpose very well. It is also essential that the stopping and starting and re-winding should be done automatically, as well as the control of the soft and loud or sustaining pedals. The music roll is a most important factor in this class of instrument, as the various controls are operated through ducts in the tracker bar, and therefore the perforations in the roll are arranged accordingly. Some player manufacturers use a kind of endless roll with many selections on it. Others use a roll on a very large spool and this is re-wound on to the feeder spool automatically. As a matter of fact, the coin-operated instrument is in construction, more or less, that of a reproducing player-piano but without the artistic detail and refinement of the best of that class of instrument.

Electric Player Pianos. Inasmuch as electrically operated player-pianos have attained a very high state of perfection in recent years it is desirable to give an outline of two important makes which are recognized as efficient and capable of producing the most artistic renderings of musical compositions. First, we shall take the Electrelle which is operated by a series of small magnets, shoes and a revolving rail. The shoes are connected with the action of the piano and, when electrical contact is established, the shoe causes the hammer to strike the string. The mechanism is installed in the top part of the piano; the spool box, when not in use, is pushed under the keyboard, when in playing position it is drawn out, and the player sits in front, in which position he can use the pedals as in ordinary piano playing. In the spool box is an electrically energized bar with a series of small contact brushes placed above, there is a brush for each magnet arranged for an eighty-eight note scale, i.e. nine to the inch. When a perforation appears in the roll, which is the ordinary paper roll, the brush comes in contact with the electrical bar and completes an electrical circuit, and when the paper is interposed between the brush and the bar the contact is broken. An electric motor operates the roll and re-wind mechanism and is controlled by a brake. As an expression device there is an extra hammer rail which is divided into three sections, all three sections being hinged together and forming a sort of floating rail. Each section is controlled from a button in front. In the normal position, and when in use, the hammers are near the string, consequently strike with less force; when greater force is required the player depresses the button corresponding with the section he desires to influence, which brings back the hammer section, thus gaining force. In fact, by a clever manipulation of the buttons, almost anything in the way of accenting can be accomplished. The writer has listened to the most wonderful tone shading on one of these instruments by an expert demonstrator, of course; an ordinary electric switch will supply all the power required, or dry cell batteries. The other instrument we shall consider is the *Tel-Electric*. It is years since the writer first examined one of these wonderful instruments and even then the results were good and clever; however, like pneumatic players, great progress has been made in recent years and, as a consequence, great artistic results can be achieved with one of these instruments. The Tel-Electric has a series of magnets placed underneath the keys, one for each key to which the magnet is attached. The music roll is of brass instead of paper, and is very small. The roll has the usual perforations by means of which contacts are made. One peculiar feature in the Tel-Electric is the control box, which, by means of a flexible cable, can control the player-piano from any part of the room. An electric motor is used for motive power, both in playing forward and in re-winding, the speed being regulated by a resistance device. Regarding electric player-pianos, one undoubted advantage is the fact that the mechanism can be installed into a normal sized piano, grand or upright. On the other hand, on account of the resiliency and elasticity of air the pneumatic action predominates very considerably.

Euphona. Made by the Cable Co., Chicago. Two exhausters, one equalizer, single valve type, has mechanical tracking device. Six point motor with three double units. Double divided hammer rail operated pneumatically by buttons on key slip, sustaining pedal controlled by button on key slip or by perforation in tracker bar.

Gulbransen Piano Player. Made by the Gulbransen-Dickenson Co., Chicago. Single valve system. Two exhausters and two equalizers, special system of pedal leverage, whereby a perfect pedal accent is obtained. This action is of the unit system, each valve and pneumatic forming a complete unit, which is detachable. Tracker bar is movable for the purpose of getting perfect alignment of music roll and tracker ducts. Six point motor, three cylinders with pistons and connecting rods, controlled by reciprocating valves, each cylinder has a double action. Tone gradation obtained by raising hammers towards strings pneumatically.

W. W. Kimball Co. Two exhausters horizontally placed. Single valve type. Four point motor, double divided soft pedal arrangement, pneumatic hammer rail lifters.

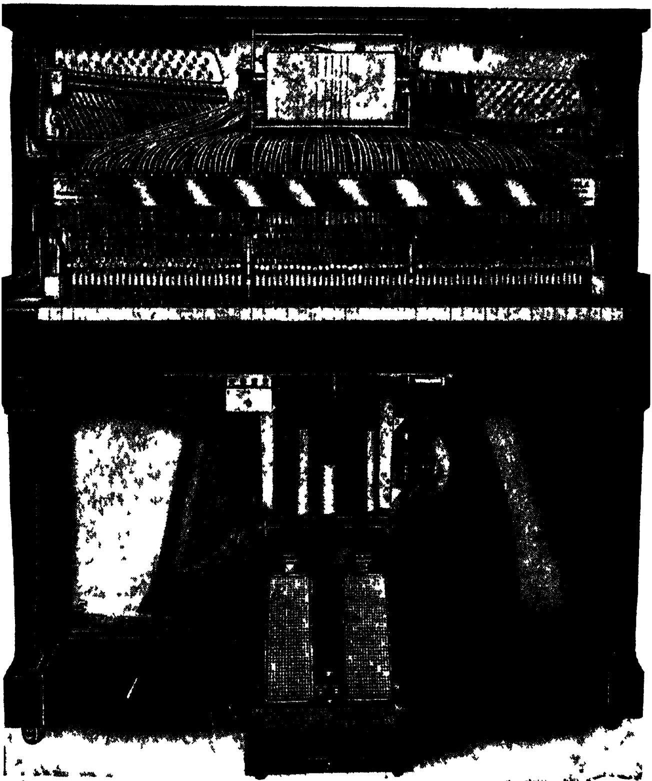
Kranich & Bach. Two exhausters, one equalizer. Single valve type, special valves with diaphragm perforated in middle, which, when inflated, form direct passage to pneumatic from reduced air pressure chamber. Five point motor, mechanical tracking device. Hammer rail divided in three parts and pneumatically controlled from buttons on key slip, sustaining pedal pneumatically operated through perforated stud in key slip. Separate cut off, mechanical tracking device.

The Lauter Humana. Made by the Lauter Co., Newark, N.J. Two exhausters, one equalizer, double valve systems. Automatic tracking device pneumatically operated from perforations in tracker bar, pneumatic sustaining pedal. Divided hammer rail pneumatically operated from buttons on key slip.

The Marquette Piano Co., Chicago. This company's pneumatic player has two exhausters, one equalizer. Single valve system, mechanical tracking device. Six point motor with three double valves. Mechanically controlled sustaining pedal and hammer rail.

Henry F. Miller & Sons, Co., Boston. Two exhausters, two equalizers. Double valve system, primary and secondary valves with vent, contained in one unit box, which is easily detachable. Diaphragm pneumatics. Tracking device, mechanically operated re-wind. Five point motor.

The Pianola. Manufactured by the Aeolian Co. The name " pianola " is the exclusive property of this company and must not be applied to any other make of piano-player or player-piano. Many designs and models are made, but the following general description will suffice. Double and single valve actions are used. Two exhausters, single equalizing unit, special folding pedals, automatic sustaining pedal. Tracking device, themodist device for accenting the melody. Metrostyle for giving correct variations of tempo. Six point motor, three double units. Two expression governors, treble and bass. These are operated from marginal perforations in the roll, or can be controlled from levers in front of the piano. There is also a cut-out valve, so that one can let the roll move on without playing the notes. This is a great advantage in long selections, as one may desire to cut out some parts. The sustaining



By the courtesy of *Messrs. Boyd Ltd.,*

FIG. 9

INTERIOR OF PISTONOLA

pedal which can be operated pneumatically can also be operated mechanically from a lever in front.

The Pistonola. This instrument is manufactured by Boyd, Ltd., London. The action is all metal and works with a tension twenty-five times greater than that usually employed in pneumatic players. The action can be installed into a piano of ordinary dimensions. Instead of bellows. self-lubricating pistons are used, fitted in a single row of metal cylinders. The pistons are made of a special composition of graphite, compressed and moulded with a glass-like surface, and work silently. The air chambers are so small that a metal block 4¾ in. by 1½ in. contains nine complete striking pneumatics. The device for accenting melody notes is called the modulist, and is controlled from marginal perforations in the music roll. There is also a device called the crescodant by means of which crescendos and diminuendos are obtained. The following explains the modus operandi of the pistonola action.

When a perforation in the music roll opens the duct in tracker bar, air passes down the tracker tube and up under the plunger situated in the front part of valve block, the air then lifts plunger, this in turn lifts small cone valve (called primary) off its seating, the air then passes down by the stem of the valve at the back of valve block; this valve consisting of washer discs, plunger and ball is called the secondary valve. The air lifts ball off its seating by means of washer and plunger up to top of seat, thereby shutting off ball chamber from the atmosphere; this chamber is in communication with the cylinder by means of a hole in the side, another hole leading from this at right angles direct into cylinder, the air space above the piston in cylinder is now in direct communication with the main air supply by means of opening under ball seat, the air

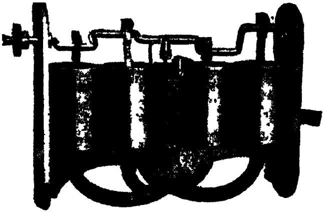


Fig. 10

Fig 12

Fig. 13

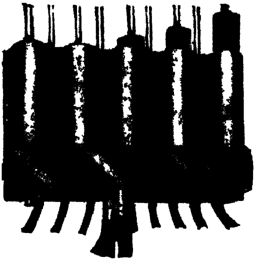


Fig. 11

MOTOR AND VALVES OF THE PISTONOLA

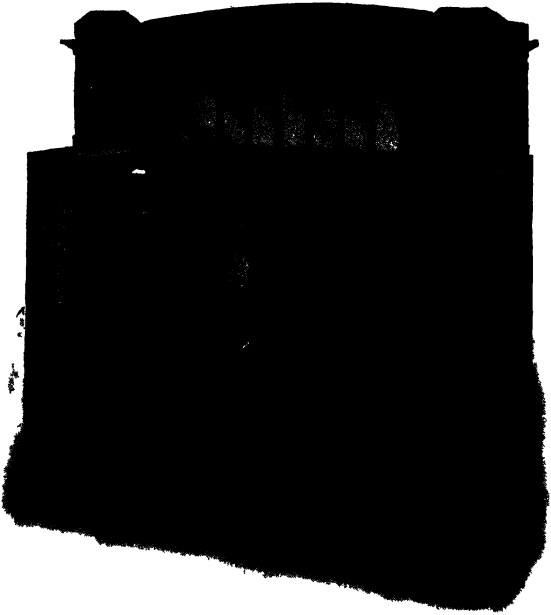
in space above piston is now drawn out by suction of the pumps, causing the atmosphere on the outside to push the piston up, lifting the whippen by the connecting cord.

Normally the air in space above piston is in communication by means of the seat opening above ball. While a note is being played there is a partial vacuum above the piston, but as soon as a hole in the tracker bar is shut off by the music roll the valve falls back and the air from atmosphere passes back through top seat, opening the ball chamber and then into cylinder, the piston then falls into normal position.

Schumann. Made by the Schumann Piano Co., Chicago. The bellows system is made in two separate parts, each having an exhauster and an equalizer, also contains an accenting device, which allows the accenting to be done by the pedalling. Single valve system. Six point motor. Device for stopping motor apart from tempo lever controlled from button on key slip. Double divided hammer rail, sustaining pedal pneumatically controlled from buttons on key slip.

Standard Pneumatic Action Co., New York. This action is used by many piano makers. Two exhausters, two equalizers, auxiliary accenting valve. Double valve action, vertical primaries and horizontal secondaries in separate chests. Tracking device controlled from marginal perforations in tracker bar. Five point motor, sustaining pedal, and divided hammer rail controlled mechanically from levers in front.

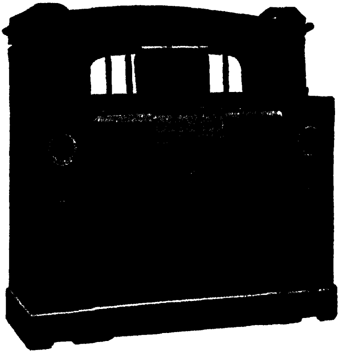
The Steinway Welte-Mignon. Made in three styles, namely, the Steinway Piano without piano keys and with a reproduction instrument inside, which is the original form in which it was produced ; the Steinway Piano with keys, which can be played on by hand as an ordinary piano ; and a cabinet player, which can be applied to any pianoforte now in use. The instrument consists of an upright pianoforte with a pneumatic attachment, which is worked by electricity. This attachment represents the highest possible development of the pneumatic piano-player. A very small and silent electric motor which is contained in the instrument furnishes the motive power for the pneumatic attachment, and can be readily attached to an ordinary electric lighting current in any living room, which means that you can switch on the electric power on your piano with as little trouble as you switch on the electric



By the courtesy of *Messrs. Steinway & Sons*

FIG. 14

light on your reading table. After the insertion of the perforated roll, you press a button which starts the motor, and the instrument pours forth the desired melodies in masterly reproduction. At the finish, the music is automatically rolled up again and the motor stopped, ready for the insertion of a fresh roll. It is claimed by the makers that the Steinway-Welte with keyboard is of the highest educational value. The amateur seated before it can play under the direct tuition of the world's greatest executants. All the latest Steinway features are embodied in this instrument, which can be used as an ordinary upright grand. The roll holder and blowing apparatus are placed on the top of the pianoforte, and the striking apparatus is situated below the keyboard, leaving the width about the same as that of an ordinary piano.



By the courtesy of *Messrs. Steinway & Sons*

FIG. 15

The Sterling Co., Derby, Conn. Two exhausters, one equalizer. Double valve system, primaries are in the form of diaphragm pneumatics. The vent to each primary is in its upper surface. Five point motor. Divided hammer rail pneumatically controlled from buttons on key-slip. Mechanical tracking device.

Symphonola and Harmonola. Made by the Price & Teeple Piano Co., Chicago. Two exhausters, two equalizers, with high and low tension, adjustable tension springs, transposing device, also tracking arrangement pneumatically controlled. Single valve system. Six point motor with three double valves, automatic sustaining pedal, or can be operated mechanically. Double divided hammer rail pneumatically controlled from buttons on key slip action, cut-off box.

GLOSSARY OF TERMS

Auxiliary Equalizers.—Boxes usually about 6 in. by 4 in. superficial area with expansion of about 5 in. kept expanded by a spring. Their function is to regulate the air pressure to the motor or the valve chamber. To govern the motor the auxiliary equalizer is placed between the motor gate box and the exhausters. To govern the force of the power pneumatics it is placed between the valve chamber and the exhausters.

Accentuation Control.—The control of the power pneumatics by the auxiliary equalizers between the valve chamber and the exhausters. In an action where the bass and treble are partitioned off there are two auxiliary equalizers.

Brake Wheel.—Used on transmission gear of motor to keep the music roll taut when playing.

Button.—This is attached to the valve stem and comes immediately in contact with the pouch purse or diaphragm when it is inflated.

Bleed Hole.—The small hole or vent interposed between and connected with the main exhaust. Its diameter is about one sixty-fourth of an inch.

Bracket.—For fixing spool box to wrest plank of the piano.

Bottom Action.—Exhausters, equalizers, pedals, etc.

Chokers.—Auxiliary equalizers or governors.

Celeste Rail.—Felt on rail in front of piano hammers and forming soft pedal.

Cut Out.—Valve which cuts off the connection between the main valve chamber and the main exhaust, thus permitting one to " skip " any portion of a roll.

Cap.—Face board covering equalizers and other valve boxes, made to take off easily to get at valves and springs.

Channel—Duct or Airway.

Clutch Socket.—For taking right end of roll; situated in spool box.

Diaphragm.—Meaning pouch or purse, as for instance the primary pouch board.

Elbow.—Metal piece on one end of motor for attaching to rubber tube.

Equalizers.—Wrongly called a reservoir, usually placed in front of exhausters. Their function is to maintain a steady exhaust.

Exhausters.—The main bellows or pumpers.

Expression Box.—Auxiliary equalizer.

Expression Pneumatic.—Accenting valve.

Face Board.—The cap in front of equalizers and other valve boxes.

Feeders.—By feeders is meant the large exhausters. Feeder is a misnomer, as they do not feed, but exhaust.

Feeder Spool.—The spool on which the music roll is wound.

Gear Set.—Transmission gear.

Gate Box.—Box in which are placed valves for regulating the outward and inward flow of air, as in the motor gate box.

Governor.—Auxiliary equalizers.

Hammer Rail.—A base covered rail on which the piano hammers rest as they return from the strings.

Motor.—The motor drives the transmission gear.

Nipple.—Metal piece for attaching to rubber tubes, as at back of tracker bar.

Pallets.—Leather valves on exhausters and inside main equalizers.

Pedal Arms.—For connecting pedals with exhausters.

Power Pneumatics.—Large pneumatics which lift the whippen and cause the hammers to strike the strings.

Reservoir.—By reservoir is meant the main equalizer. Reservoir is a wrong term, as the air is not stored, but exhausted.

Re-wind Lever.—Placed on key slip of piano and operating re-wind valve in gate box and cutting-off air from pneumatics.

Reduced Air Pressure Chamber.—A chamber that is in direct connection with the main exhaust and wrongly spoken of as a vacuum chamber.

Striking Pneumatics.—Power pneumatics.

Sprocket Wheel.—The large sprocket wheel on transmission gear.

Shifter Pneumatics.—Tracking device is operated by these pneumatics.

Spool Box.—The box containing the tracker bar and the take-up spool, placed in the centre and on top of the valve chamber.

Support Blocks.—Blocks at either end of the piano above the keyboard to support the top action.

Sustaining Pedal.—The pedal which lifts the dampers off the strings, sometimes, but erroneously, called the loud pedal.

Tracker Bar.—Metal bar with holes opening into ducts which lead to the primaries.

Treadles.—Another name for pedals.

Transmission Gear.—The gearing on left-hand side of motor which operates the take-up spool when playing forward and the feeder spool when re-winding.

Take-up Spool.—The large spool in lower part of the spool box and on which the music roll is wound when playing.

Tempo.—Meaning time.

Tempo Indicator.—Is usually in front of spool box showing degress of time as indicated on music roll. The pointer of same being operated from the tempo lever.

Tempo Lever.—Placed on key slip of piano and operating valves in motor gate box.

Tempo Valve Box.—Motor gate box.

Tension (High).—When there is a free air-way from tracker duct to exhausters, the tension is high and causes the power pneumatic to collapse with greater force, producing a more powerful tone.

Tension (Low).—The reverse of high tension. The air being deflected in its course from the tracker duct to the exhausters through auxiliary equalizer, in which is a hinged valve which partially closes the port to the exhausters, thus reducing the force of power pneumatic and causing the hammer to strike softly.

Top Action.—The valve chamber containing primary and secondary valves and supporting spool box.

Valves.—These include slide valves, round valves and discs.

Ventiduct.—An accenting device through which the auxiliary equalizer is cut off from the main exhaust, thus establishing a direct connection between the valve chamber and the exhausters and securing instantly high tension.

Valve Chamber.—This means the top action containing the primary and secondary valves.

INDEX

AEOLIAN Company, the, 92
Allison piano, 78
American Player Action Co., 79
Amphion, the, 80
Angelus, the, 80
Apollo, the, 82
Appreciation of music, vi
Autopiano Company, the, 84
Auto Pneumatic Action Company, the, 82
Autotone, the, 84

BEHR Bros. & Co., 84
Blüthner & Co., 85
Boyd, Ltd., 94
Brake on gear, care of the, 42
Buffalo, conference in, 48

CABLE Company, the, 91
Carola piano player, the, 85
Cecilian, the, 88
Céleste pedal, 28
Coin-operated player piano, 88
Control mechanism, 23, *sqq.*
Crescodant, the, 94
Cyphering, 37 *sqq.*

ELECTRIC player pianos, 89
Equalizer, 33, 34
Euphona, 91
Evans, Edwin, vii
Expression devices, 27 *sqq.*

FARRAND Company, the, 88
Faulty tracking, 35
—— repetition, 36
Fourneaux, 3

GULBRANSEN piano player, the, 91
—— -Dickenson Company, the 91

HARDMAN, Peck & Co., 84
W. W. Kimball Company, the, 91

KRANICH & Bach, 91

LAUTER Company, the, 92
—— Humana, the, 92
Leaks, 39
London County Council lectures, vi

McTAMMANY, John, 1, 2,
Marquette Piano Company, the, 92
Maxims for player piano performers, 45-6
Melville Clark Piano Company, the, 82
Metronome, 71
Miller & Sons, Henry F., 92
Modulist, 94
Motor racing, 40
Music roll, the, 47

ORGANETTE, 3

PIANISSIMO playing, 60
Pianola, the, 92
Piano player, the, 5 *sqq.*
Pistonola, the, 94–96
Playotone, the, 84
Pneumatic player piano, the, 13 *sqq.*
—— motor, 16
Pneumatics, principles of, 5 *sqq.*
Price and Teeple Piano Company, the, 99

RECORD rolls, 48
Rhythm, 66 *sqq.*

SCALES, major and minor, 75–6
Schumann, 96
—— Piano Company, the, 96
Solo Apollo, 25
Standard Pneumatic Action Company, the, 96
Steinway Welte-Mignon, the, 96
—— & Sons, 96–98
Sterling Company, the, 98
Stoddard-Ampico action, 79
Symphonola and Harmonola, 99

TANNHÄUSER, overture to, 59-60
Tel-electric, 90
Transmission gear, care of the, 42
Trist, Mr., 30

UNIT system, 15, 16

WILCOX & White Company, 80
Wood, Sir Henry J., vi

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